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ABSTRACT

This curriculum guide was designed for use in postsecondary small engine mechanics education programs in Georgia. Its purpose is to provide for the development of entry level skills in small engine mechanics in the areas of knowledge, theoretical structure, tool usage, diagnostic ability, related supportive skills, and occupational survival skills. The first two sections of 10 explain the philosophy and objectives of state and local vocational education, and of the guide. In section 3, the occupational field of small engine mechanics is described; and employability skills, student exit points, and tasks cross referenced to the Dictionary of Occupational Titles are listed. The curriculum structure and course outline are provided in section 4, while section 5, the main part of the guide, provides unit guides for each task to be taught. (For each task, a task description, student performance objective, suggested instructional activities, instructional materials, evaluation sections, suggested classroom hours, and related instruction tasks are included.) Section 6 contains references and resources, while student record forms comprise section 7. Following suggestions for working with special needs students (section 8), the guide concludes with a facility layout for a learning resource center and a laboratory, and definitions of terms (sections 9 and 10). (KC)

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Post Secondary

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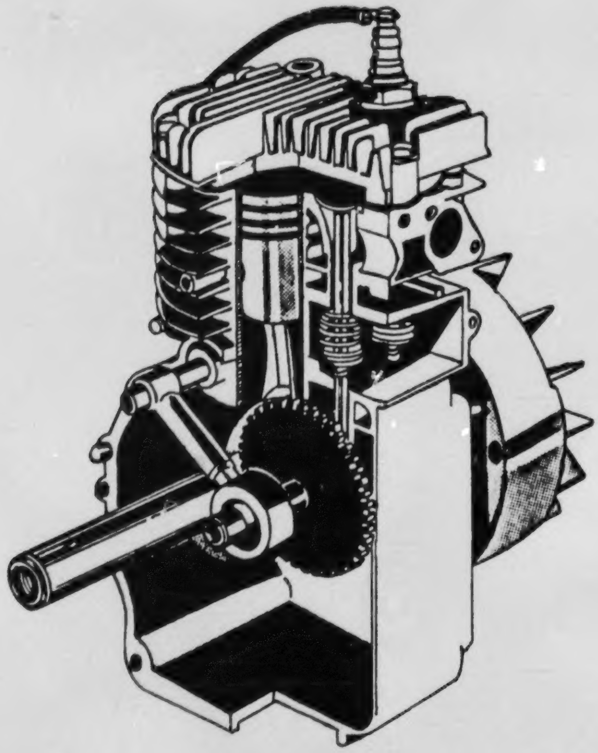

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CURRICULUM GUIDE

Georgia Department of Education

SMALL ENGINE MECHANICS

Developed Under Contractual Agreement with

Division of Program Development
Office of Vocational Education
Georgia Department of Education
Atlanta, Georgia 30334
Charles McDaniel, State Superintendent of Schools
1981

SMALL ENGINE MECHANICS

Developed By

The University of Georgia

Under the Direction of

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PURPOSE OF THE CENTER

The Vocational Education Materials Center functions within the Division of Vocational Education, University of Georgia. This Center operates under grants from the U.S. Office of Education, and the Georgia State Department of Education with the support of the College of Education. The Center is comprehensive in its commitment and approach to the development and dissemination of materials in the broad field of Vocational Education.

The purpose of the Center is to increase the capability of Georgia's delivery system for Vocational Education. Specifically, the Center is committed to:

1. Develop materials to assist in the implementation of proposed curricula and to enhance the teaching of Vocational Education.
2. Conduct and report curriculum research related to Vocational Education.
3. Provide a production and dissemination center for Vocational Education materials.
4. Provide direct experiences in curriculum development and diffusion for advanced graduate students.
5. Enable faculty members to participate in the development and implementation of a variety of curriculum materials.

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SECTION I

PHILOSOPHY & GOALS

VOCATIONAL EDUCATION IN GEORGIA

A. PHILOSOPHY

The Georgia Board of Education perceives vocational education as a vital component in the education of the young and adult citizens of this State. Appropriate programs of vocational education and ancillary services should be made readily available to individuals in middle schools, high schools, postsecondary area vocational-technical schools, vocational divisions of junior colleges, vocational centers, the Quick Start program and other adult programs designed to train or retrain workers for useful and satisfying employment.

Special services and assistance must be provided to those who need it in order to participate or benefit from vocational education. This includes women, minorities, the displaced homemaker and other displaced workers, those with limited English-speaking ability, the disadvantaged and the handicapped.

Since men and women spend the greater part of their lives at some form of work, the State should provide opportunities for all its citizens to develop the knowledge, skills and attitudes necessary for them to secure personally satisfying and socially useful employment.

B. PURPOSE

The purpose of vocational education shall be to improve the economic well-being of Georgia citizens by preparing individuals, through organized learning experiences, to select, obtain and advance in recognized occupations.

POSTSECONDARY VOCATIONAL EDUCATION

A. PURPOSE

The purpose of postsecondary vocational-technical education in Georgia is to improve the economic well-being of adult citizens by providing access to high quality vocational-technical training for skilled and semi-skilled occupations, for improvement of existing skills or for retraining in a new occupation.

B. OBJECTIVES

1. To provide vocational-technical education programs and ancillary services commensurate with the needs and interests of students and available job opportunities.

2. To provide vocational-technical education programs which are current with the state-of-the-art, competency-based, and offer multiple exit points to accomodate the students' occupational objectives.

3. To provide vocational-technical education programs which are articulated with available high school counterparts, to facilitate an easy transition from secondary to postsecondary levels without loss of credit.

4. To provide vocational-technical education programs such that 75% of those individuals who leave or complete a program of occupational preparation will find employment in the field, or a related field, for which trained.

5. To provide those guidance, counseling, financial aid, evaluative, job placement, remedial and other supportive programs and services needed by students to enroll, complete a program and become, or remain, employable in a skilled or semi-skilled occupation.

6. To provide needed assistance to special populations to include women, minorities, limited English-speaking, the displaced homemaker and other displaced workers, the disadvantaged and the handicapped.

7. To provide vocational-technical education programs for full-time and part-time students on campus during the day as well as the evening hours, and to provide appropriate programs for full-time and part-time students off campus in businesses and industries, comprehensive high schools and other locations within the respective schools' service areas.

8. To serve as a center for the delivery of postsecondary and adult vocational-technical education programs and services for the community and assigned service area.

STATEMENT OF LOCAL SYSTEM PHILOSOPHY, PURPOSE AND GOALS FOR VOCATIONAL EDUCATION

SECTION II

PURPOSE & OBJECTIVES

PURPOSE OF GUIDE

The purpose is defined in terms of the functional needs of each of the identified classes of users in the secondary and post secondary systems.

(a) Vocational teachers.

1. Provide a guide for organizing their program of instruction,
2. Assist in establishing program objectives,
3. Serve as a curriculum materials resource guide,
4. Improve communications with employers and advisory committees,
5. Facilitate competency based instruction,
6. Facilitate either group or self-paced instruction,
7. Include content by quarter and semester,
8. Cross-reference with existing state developed instructional materials (PLACE packages and post secondary I.I.).

(b) Vocational supervisors and administrators.

1. Assist in defining the scope and content of their programs,
2. Provide a means to improve curriculum management functions,
3. Serve as a guide for admissions and job placement functions,
4. Improve communications with employers and advisory committees.

(c) Counseling and guidance staff.

1. Provide a data base for counseling and guidance personnel,
2. Identify student exit points (Carrer Options),
3. Serve as guide for admissions and job placement,
4. Correlate with the new State Board of Education graduation requirements,
5. Provide specific content sequencing by quarter and semester for student scheduling,
6. Provide (a) curriculum options for the disadvantaged handicapped student, (b) curriculum modifications for SPECIAL NEEDS students, (c) typical admission requirements for regular and SPECIAL NEEDS students.

(d) Local Curriculum Coordination Committees.

1. Serve as a guide in working out articulation arrangements,
2. Improve definitions of the relationship between secondary clusters and post secondary specialized programs.

This guide will serve as an ideal communication device between school personnel and the craft advisory committee. By personally reviewing the guide with the local craft advisory committee the teacher will be able to maintain the accuracy of the guide in terms of the local job market and will also be able to inform representatives of local industry regarding the content of the program itself.

SMALL ENGINE MECHANICS PROGRAM OBJECTIVE

Given appropriate instruction, as suggested by this guide, a student completing the program should demonstrate entry level skills in Small Engine Mechanics in the areas of knowledge, theoretical structure, tool usage, diagnostic ability, related supportive skills and occupational survival skills.

As the student progresses through the program, sufficient competencies will be acquired to enable the student to enter the occupational field at the following curriculum exit points.

Gas Engine Repairer	(D.O.T. Code 625.281-026)
Power Saw Mechanic	(D.O.T. Code 625.281-030)
Small Engine Mechanic	(D.O.T. Code 625.281-034)
Out Board Motor Mechanic	(D.O.T. Code 623.281-042)
Boat Rigger	(D.O.T. Code 806.464-010)
Diesel Mechanic Helper	(D.O.T. Code 625-684-010)

SECTION III

D. O. T. DESCRIPTION, EXIT POINTS, TASKS

DESCRIPTION OF OCCUPATIONAL FIELD

The primary purpose of this section is to provide a general orientation to the occupational field. This orientation may be used by counseling and guidance staff in helping students to select subject areas. It may also be used by instructors for new students just entering the program area. The description delimits the scope of the occupational field in terms of the range of activities involved in a series of occupations. It contains information about career potential within the occupational field, including job market conditions and trends.

The description identifies prerequisite skills and knowledge for those students interested in entering the occupational field. In addition, the Description of Occupational Exit Points are provided to aide the instructor in identifying possible jobs for early leavers. A listing of employability skills is also included in this section.

Small Engine Mechanic

Nature of the Work

There are constant changes in the skill mix of service techniques in the small engine repair business. The image of the small engine mechanic in no longer one of a part time mechanic operating out of a garage during the summer season. Rather, today's small engine mechanic is one whose role is two-fold. Not only are many small engine mechanics capable of making repairs; they are astute business managers as well.

Mechanics who specialize in small engine repairs require considerable experience and training. They must have the ability to make a quick and accurate diagnosis, exhibit good reasoning ability and possess a thorough working knowledge of small engines.

Working Conditions

Generally, small engine mechanics work indoors. Modern repair shops are well ventilated, lighted, and heated; older shops may not have these advantages. Mechanics frequently work with dirty and greasy parts, and in awkward positions. Many of the engine parts and tools that mechanics lift are heavy. Minor cuts and bruises are common, but serious accidents can be avoided by keeping the shop clean and orderly and by observing other safety practices.

Places of Employment

Small engine mechanics are employed in a variety of situations. They are employed by manufacturing companies, automobile dealers, boating dealers, equipment dealers, repair shops, and even in government related jobs. Still, others are selfemployed. They are employed in every section of the country. Geographically, employment is distributed about the same as the population.

Training, Other Qualifications, and Advancement

Vocational Education courses provide a solid grounding which serves as a springboard into work situations which then provide on-the-job experience and growth. Additional training for these new employees as well as experienced service technicians is available from the engine and equipment manufacturers field and factory schools. These continuing education programs keep both new and experienced service technicians abreast of new engines, equipment and the latest repair techniques.

Employment Outlook

Each year, there are more air-cooled engines produced in the United States than automobiles. Over 12,000,000 engines under 20 hp are manufactured annually. Most of these engines power a variety of outdoor power equipment from mowers to tillers to tractors. Millions more operate pumps, generators, small construction equipment, log splitters, truck refrigeration units...almost anything requiring portable rotary power within their horsepower ranges.

A very conservative engine life average of 5 years considering all applications provides more appreciation of the gigantic engine population repsenting the potential market for service during any one year...60,000,000 engines. But engine numbers are only part of the challenge.

As engine sizes increase and engine-powered equipment becomes more complex, skill-level demands upon service technicians also increase.

Sources of Additional Information

For more information concerning small engine mechanics and small engine repair contact: Briggs and Stratton Corporation; P. O. Box 702; Milwaukee, Wisconsin, 53201.

Description of Occupational Exit Points*

625.281-026 GAS-ENGINE REPAIRER (any ind.)

Repairs and maintains gas-driven, internal-combustion engines that power electric generators, compressors, and similar equipment, using handtools and precision-measuring devices. Reads operating reports and diagnoses causes of trouble. Disassembles engines and adjusts or replaces parts using handtools. Verifies clearances and adjustments using precision-measuring devices. Reassembles engines and listens to engines in action to detect operational difficulties. May repair air or gas compressors.

625.281-030 POWER SAW MECHANIC (any ind.) chain-saw mechanic.

Repairs and maintains portable saws powered by internal combustion engines, following manufacturer's repair manuals and using handtools. Disassembles engine and replaces defective parts, such as piston rings, bearings and timing mechanism. Cleans or replaces fuel lines and adjusts carburetors. Replaces broken links in chain saw or installs new chain. Replaces rotary or reciprocating blades in other saws as indicated.

625.281-034 SMALL ENGINE MECHANIC (any ind.)

Repairs fractional horsepower gasoline engines used to power lawnmowers, garden tractors and similar machines using handtools. Locates causes of trouble, dismantles engines using handtools, and examines parts for defects. Replaces or repairs parts such as rings and bearings using handtools. Cleans and adjusts carburetor and magneto. Starts repaired engines and listens to sounds to test performance. Replaces engines on machine. May be designated according to type of engine repaired as LAWNMOWER MECHANIC (any ind.)

625.684-010 DIESEL MECHANIC HELPER (any ind.)

Assists DIESEL MECHANIC (any ind.) in overhauling and maintaining diesel motors used to operate trucks, generators, and other equipment. Disassembles motor and cleans parts. Obtains parts from stock and hands tools to mechanic. Assists in reassembly, and cleans tools and working area. Performs other duties as described under HELPER (any ind.)

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* From D.O.T.

623.281-042 OUTBOARD MOTOR MECHANIC (engine & turbine; ship & boat bldg. & rep.)

Analyzes defects, and adjusts or repairs electrical and mechanical systems of outboard motors: Disassembles and inspects motor for defective parts, using mechanic's handtools and gages. Replaces parts, such as gears, magneto points, piston rings, and spark plugs, and reassembles engine. Adjusts carburetor mixture and electrical point settings while motor is running in water-filled test tank. May change porpeller to increase motor efficiency, based on size and shape of boat hull. May install or repair steering and throttle controls.

806.464-010 BOAT RIGGER (ret. tr.; ship & boat bldg. & rep.) boat accessories installer; outboard-motorboard rigger.

Installs accessories in outboard and inboard motorboats: Drills holes, attaches brackets, and installs accessories, such as lights, batteries, ignition switches, fuel tanks, and guide pulleys, using handtools and power tools. May change propellors and adjust motors to obtain maximum performance. May install outboard and inboard motors and controls, using handtools. May load boats on trailers and make deliveries to customers.

EMPLOYABILITY SKILLS

In addition to the aptitudes, abilities, interests, physical requirements and job skills listed in the preceding Description of Occupation, employability skills exert a great deal of influence on a person's ability to get and keep a job. Surveys indicate that more people lose their jobs because of poor attitudes toward their job than for lack of job skills. For this reason it is important that information concerning the following employability skills be provided as an ongoing part of the program.

1. Getting a job
    - a. Filling out job applications
    - b. Developing a resume
    - c. Preparing for a job interview

2. Keeping a job
    - a. Be on time and regular in attendance
    - b. Maintain a fair share of the work-load
    - c. Work without supervision
    - d. Meet production schedules
    - e. Properly care for and use equipment
    - f. Dress appropriately for the job
    - g. Maintain good personal hygiene
    - h. Develop and maintain good communication with supervisors and co-workers

SMALL ENGINE MECHANICS EXIT POINTS

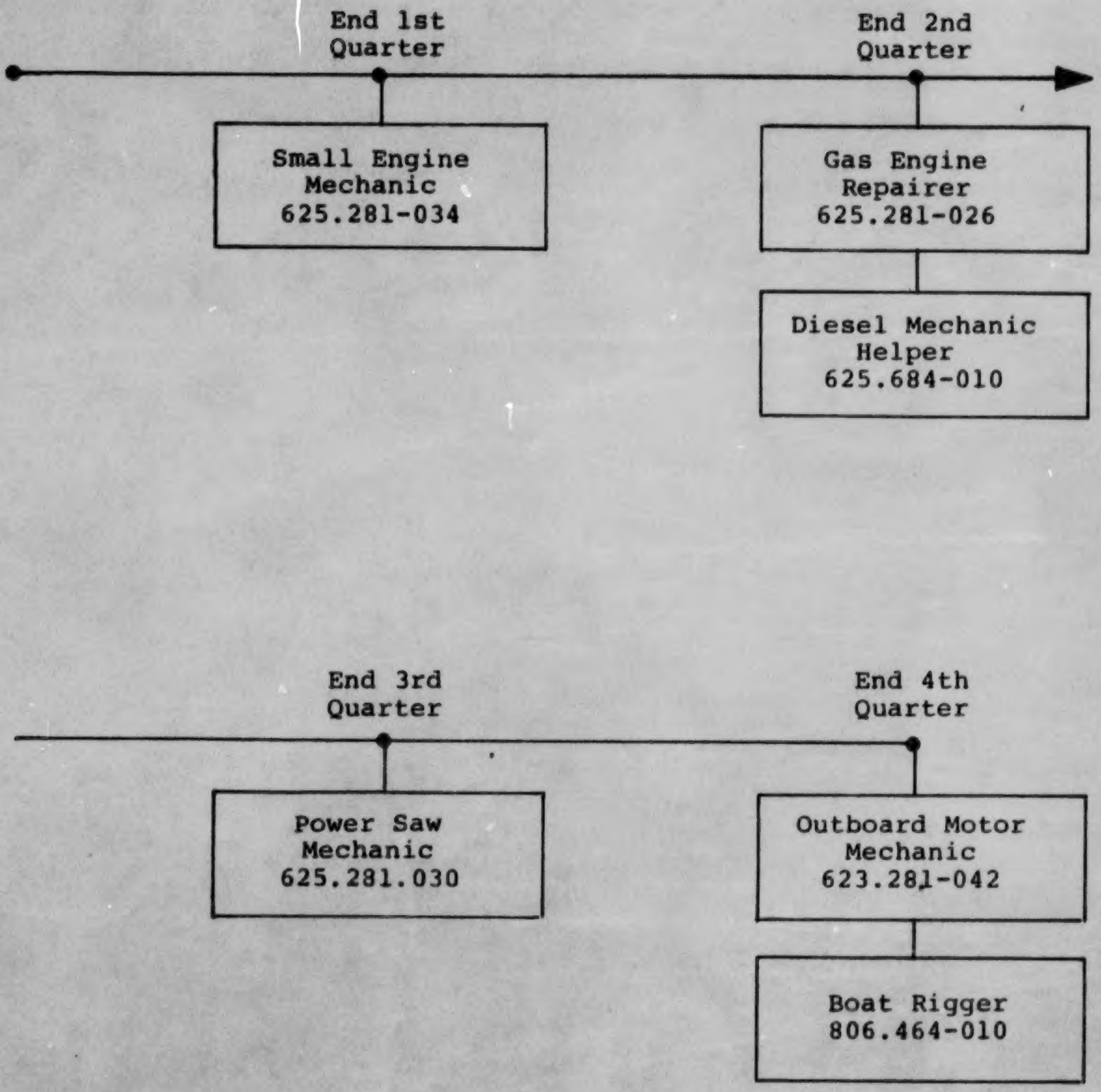
The diagrams on the following pages are based on the Suggested Course Outline Structure. They graphically illustrate the points in the Small Engine program where the student should have acquired the competencies necessary for entry level employment into the job classifications indicated. In many cases by the time a student reaches an exit point he/she may have acquired several competencies in addition to those required for the specific job classification.

The course outline is structured to prepare students to become light and heavy duty Small Engine Mechanics, Power Saw Mechanics, Outboard Motor Mechanics, Boat Riggers and Diesel Mechanic Helpers. Every student, upon leaving the program, should have entry level skills in some related occupation.

The Task Listing by D.O.T. Code indicates the entry level skills (tasks) required for the student to be considered employable in a specified occupation. If the local program is individualized it should be relatively easy to move a potential program leaver (drop out) into those skills (tasks) which would qualify the student for one of the listed occupations.

EXIT POINTS

SMALL ENGINE MECHANICS


End 1st Quarter
End 2nd Quarter
Small Engine Mechanic 625.281-034
Gas Engine Repairer 625.281-026
Diesel Mechanic Helper 625.684-010
End 3rd Quarter
End 4th Quarter
Power Saw Mechanic 625.281.030
Outboard Motor Mechanic 623.281-042
Boat Rigger 806.464-010

TASK LISTING BY D.O.T. CODE

The tasks are listed in this section in a matrix format that cross references them with the applicable D.O.T. codes and the exit point occupational titles. Each task is identified with one or more of the exit point occupational titles. This information may be used to make a specific determination as to when a student has developed the necessary skills to qualify for an exit point and is particularly useful in preparing early leavers to meet the requirements for a specific occupational title.

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
TASK NO.	**TASK NAME** / DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
	DUTY A Related Instruction									
*RI-01	Demonstrating and utilizing school and shop policies and procedures.	X	X	X	X	X	X			
*RI-02	Maintaining a parts inventory.	X	X	X	X	X	X			
*RI-03	Reading and interpreting the shop service manuals.	X	X	X	X	X	X			
*RI-04	Completing job work order forms.	X	X	X	X	X	X			
*RI-05	Identifying and maintaining shop tools and equipment.	X	X	X	X	X	X			
*RI-06	Using precision measurement tools and equipment.	X	X	X	X	X	X			
*RI-07	Demonstrating engine theories of operation.	X	X	X	X	X	X			
*RI-08	Demonstrating a knowledge of electricity fundamentals.	X	X	X	X	X	X			
*RI-09	Demonstrating a knowledge of fuels	X	X	X	X	X	X			
*RI-10	Demonstrating a knowledge of lubricants.	X	X	X	X	X	X			
*RI-11	Demonstrating a knowledge of hardware and fasteners.	X	X	X	X	X	X			
*RI-12	Demonstrating basic metals operation.	X	X	X	X	X	X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
TASK NO.	TASK NAME									
*RI-13	Demonstrating welding and soldering techniques.	X	X	X	X	X	X			
*RI-14	Demonstrating a knowledge of applied mathematics.	X	X	X	X	X	X			
*RI-15	Demonstrating a knowledge of applied science.	X	X	X	X	X	X			
SMALL ENGINE SERVICE										
	DUTY I - Service, maintain and repair the fuel system									
*SE-01	Servicing the fuel tank, fuel lines, and fuel filter	X	X	X	X	X	X			
*SE-02	Servicing the air cleaner	X	X	X	X		X			
*SE-03	Adjusting fuel/air mixtures and mechanical linkage	X	X	X	X	X	X			
*SE-04	Reconditioning the float-type carburetor	X	X	X			X			
*SE-05	Reconditioning the suction-lift-type carburetor	X		X						
*SE-06	Reconditioning the diaphragm-type carburetor	X	X	X			X			
*SE-07	Reconditioning fuel pumps	X	X	X			X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
TASK NO.	TASK NAME									
*SE-08	Repairing and adjusting governors	X	X	X			X			
*SE-09	Diagnosing fuel system problems									
	DUTY II - Service, maintain and repair the ignition system.									
*SE-10	Inspecting, selecting and installing spark plugs	X	X	X			X			
*SE-11	Timing the ignition system	X	X	X			X			
*SE-12	Testing, removing and replacing magneto ignition components	X	X	X			X			
*SE-13	Testing, removing and replacing battery ignition components	X	X	X			X			
*SE-14	Testing, removing and replacing electronic ignition components	X	X	X			X			
*SE-15	Diagnosing ignition system problems	X	X	X			X			
	DUTY III - Service, maintain and repair the starting system									
*SE-16	Inspecting and repairing the rope type starting systems	X	X	X			X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	DOT NO. 625.281-026 DOT DESCRIPTION Gas Engine Repairer	625.281-030 Power Saw Mechanic	625.281-034 Small Engine Mechanic	625.684-010 Diesel Mechanic Helper	806.464-010 Boat Rigger	623.281-042 Outboard-Motor Mechanic			
*SE-17	Inspecting and repairing the wind-up starting systems	X	X	X			X			
*SE-18	Inspecting and repairing electric type starting systems	X		X			X			
*SE-19	Diagnosing starting system problems	X	X	X	X		X			
	DUTY IV - Service, maintain and repair the charging system.									
*SE-20	Testing and servicing storage batteries and battery packs	X		X	X		X			
*SE-21	Testing and repairing DC generators and components	X		X	X		X			
*SE-22	Testing and repairing AC generators and components	X		X	X		X			
*SE-23	Testing and repairing the combination generator/starter and components	X		X						
*SE-24	Diagnosing charging system problems	X		X	X		X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

		POSSIBLE EXIT POINTS					
	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic
TASK NO.	**TASK NAME** / DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042
	DUTY V - Service, maintain and repair the exhaust and emission control system.						
*SE-25	Removing and replacing mufflers and exhaust pipes	X	X	X	X		
*SE-26	Cleaning 2-cycle exhaust systems	X	X	X			X
*SE-27	Maintaining emission control devices	X		X	X		X
*SE-28	Diagnosing exhaust and emission control systems problems	X	X	X	X		X
	DUTY VI - Recondition cylinder head and valves						
*SE-29	Checking valve operation	X		X	X		
*SE-30	Grinding valves and valve seats	X		X	X		
*SE-31	Inspecting and repairing the cylinder head	X	X	X	X		X
*SE-32	Adjusting valve clearances	X	X	X	X		X
*SE-33	Repairing 2-cycle engine valves						
*SE-34	Diagnosing valve problems	X	X	X	X		X

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	DOT NO. 625.281-026 DOT DESCRIPTION Gas Engine Repairer	625.281-030 Power Saw Mechanic	625.281-034 Small Engine Mechanic	625.684-010 Diesel Mechanic Helper	806.464-010 Boat Rigger	623.281-042 Outboard-Motor Mechanic			
	DUTY VII - Recondition cylinder, cylinder block and components of air cooled 4-cycle gas engines.									
*SE-35	Inspecting and measuring wear condition	X		X	X					
*SE-36	Disassembling and inspecting component parts	X		X	X					
*SE-37	Reassembling and replacing component parts	X		X	X					
*SE-38	Diagnosing 4-cycle engine problems	X		X	X					
	DUTY VIII - Recondition cylinder, cylinder block and components of air cooled 2-cycle gas engines.									
*SE-39	Inspecting and measuring wear condition		X	X	X		X			
*SE-40	Disassembling and inspecting component parts		X	X	X		X			
*SE-41	Reassembling and replacing component parts		X	X	X		X			
*SE-42	Diagnosing 2-cycle engine problems		X	X	X		X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
TASK NO.	TASK NAME									
	DUTY IX - Recondition cylinder, cylinder block and components of air cooled single cylinder diesel engines.									
SE-43	Inspecting and measuring wear condition				X					
SE-44	Disassembling and inspecting component parts				X					
SE-45	Reassembling and replacing component parts				X					
SE-46	Testing and reconditioning of fuel injection system				X					
SE-47	Diagnosing single cylinder diesel engine problems				X					
	DUTY X - Recondition cylinder(s), cylinder block and components of small engines greater than 12 horsepower									
SE-48	Inspecting and measuring wear condition	X			X		X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT DESCRIPTION / DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
SE-49	Disassembling and inspecting component parts	X			X		X			
SE-50	Reassembling and replacing component parts	X			X		X			
SE-51	Testing and reconditioning of fuel system components	X			X		X			
SE-52	Testing and renewing ignition system components	X					X			
SE-53	Diagnosing problems in multi-cylinder engines	X			X		X			
EQUIPMENT REPAIR										
	DUTY I - Service and maintain lawn mower assemblies									
ER-01	Inspecting the assembly	X		X						
ER-02	Sharpening and balancing the blade	X		X						
ER-03	Adjusting and replacing the wheels	X		X						
ER-04	Cleaning and lubricating the assembly	X		X						

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

TASK NO.	TASK NAME	POSSIBLE EXIT POINTS								
	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
ER-05	Inspecting and replacing drive mechanisms	X		X						
ER-06	Repairing frame damage	X		X						
ER-07	Installing a short block assembly									
	DUTY II - Service and maintain garden tiller assemblies									
ER-08	Inspecting the assembly	X		X						
ER-09	Cleaning and lubricating the assembly	X		X						
ER-10	Adjusting and replacing wheels	X		X						
ER-11	Inspecting and repairing the controls and drive mechanism	X		X						
ER-12	Repairing frame damage	X		X						
ER-13	Installing a short block assembly	X		X						
	DUTY III - Service and maintain chain saw assemblies									
ER-14	Handling the chain saw safely		X							
ER-15	Identifying the component parts		X							
ER-16	Servicing the assembly		X							

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	DOT DESCRIPTION → DOT NO. ↓	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
			625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
ER-17	Maintaining bar, chain and clutch			X							
ER-18	Testing, removing and replacing ignition system components			X							
ER-19	Reconditioning the carburetor and fuel system components			X							
ER-20	Repairing the starting system			X							
ER-21	Disassembling and inspecting the power unit			X							
ER-22	Reassembling the power unit			X							
ER-23	Diagnosing chain saw problems			X							
OUTBOARD MARINE ENGINE REPAIR											
	DUTY I - Recondition outboard motor power head assemblies										
*ME-01	Identifying the component parts				X			X			
*ME-02	Testing, removing and replacing magneto ignition system components				X			X			
*ME-03	Testing, removing and replacing electronic ignition system components				X			X			
*ME-04	Removing the power head from the lower unit				X			X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

	POSSIBLE EXIT POINTS									
	DOT DESCRIPTION	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
TASK NO.	TASK NAME									
*ME-05	Reconditioning the carburetor and fuel system components			X			X			
*ME-06	Disassembling and inspecting the power head			X			X			
*ME-07	Reassembling the power head			X			X			
*ME-08	Testing the motor in the tank			X			X			
*ME-09	Making final adjustments			X			X			
*ME-10	Diagnosing problems in the outboard power head			X			X			
	DUTY II - Rebuild outboard motor lower unit assemblies									
*ME-11	Identifying the component parts						X			
*ME-12	Replacing propellers					X	X			
*ME-13	Inspecting and replacing the water pump and component parts						X			
*ME-14	Disassembling and inspecting gear drive assembly						X			
*ME-15	Reassembling the gear drive						X			
*ME-16	Mounting the lower unit to the power head						X			
*ME-17	Mounting the motor on the boat					X	X			

TASK LISTING BY DOT CODE

SMALL ENGINE MECHANICS

POSSIBLE EXIT POINTS

TASK NO.	TASK NAME	Gas Engine Repairer	Power Saw Mechanic	Small Engine Mechanic	Diesel Mechanic Helper	Boat Rigger	Outboard-Motor Mechanic			
	DOT DESCRIPTION / DOT NO.	625.281-026	625.281-030	625.281-034	625.684-010	806.464-010	623.281-042			
*ME-18	Making control adjustments					X	X			
*ME-19	Diagnosing problems in the lower unit						X			
*ME-20	Winterizing and storing the outboard motor						X			
	DUTY III - Service, maintain and repair the boat and trailer									
ME-21	Installing motor controls					X	X			
ME-22	Installing steering mechanisms					X	X			
ME-23	Installing marine accessories					X	X			
ME-24	Making fiberglass repairs					X	X			
ME-25	Placing the boat on the trailer					X	X			
ME-26	Repairing trailer lighting					X	X			
ME-27	Repairing the trailer frame					X	X			
ME-28	Replacing wheel bearings					X	X			

SECTION IV

CURRICULUM STRUCTURE & COURSE OUTLINE

CURRICULUM STRUCTURE

The following examples are provided to illustrate two methods in which the post secondary small engine mechanics curriculum can be structured. These examples should not imply there are no other ways to structure the curriculum.

Alternative one is based on the curriculum outline and is a block teaching design. Alternative two is also a block design, but the Related Instruction time is included in each duty area. This allows almost immediate hands-on experiences, whereas, alternative one requires 66 hours of classroom teaching before the students receive any laboratory time.

The clock hours listed include instructional time in both the classroom and the laboratory. The additional "live work" laboratory hours are an approximation of the amount of time the student should spend on actual customer repair work. Live work should not be assigned until after successful completion of all the tasks for each quarter.

Live Work Management

It is desirable to conduct small engine mechanic training in an environment closely resembling that of an actual small engine repair shop. One method used in duplicating real conditions is customer repair work or "live work". Proper management of live work is essential to the success of the program. Often, both school personnel and the general public will exploit programs that take in such projects. This will result in the program becoming a low cost repair shop rather than a training facility. It is the administrator's and instructor's responsibility to establish and enforce a live work policy that will convey to customers the role of the vocational education program.

Live work should be assigned only to those students who have successfully completed all tasks for any given quarter. The live work project should be carefully matched to the student's abilities. Failure to do this will result in the instructor spending a large amount of time as a worker rather than a teacher. Individualized programs are particularly vulnerable to mismanaged customer repair work. The sample live work policy that follows should provide the instructor with some guidance.

SAMPLE "LIVE WORK" POLICY

POLICIES AND PROCEDURES GOVERNING "LIVE" PRODUCTION JOBS

One of the most meaningful training vehicles is customer repair work or live work requested by a customer and performed by a student. However, such jobs pose serious problems in a public school shop, problems which require rigid regulations as indicated below:

1. Live jobs must provide training for the student. This training can range from skill perfection to developing work habits or customer relation experiences.
2. All materials, parts and supplies used or required in such live work must be paid for by the customer at school cost. Under no circumstances can the school give away public funds or property through this type training. There shall be no cost on labor.
3. All purchases for items needed to do such production jobs must be processed through the school accounts. Under no circumstances should instructors place themselves in a vulnerable position by buying and reselling to customers of the school shop.
4. All monies received from customers must be receipted on an official school receipt and deposited in the school account.
5. All live work must be done by the student. The only time an instructor is to do a live job should be when it is used for demonstration purposes.
6. Under no circumstances shall the instructor or student receive money, rewards, benefits or in any way personally profit from such work, either directly or indirectly. To do so is in direct violation of state law which prohibits the use of public property for personal gain.
7. The following policies concerning the purchase of parts are intended to protect shop teachers from

any possible inference that they, or students, are using public property for personal gain. This can only be done by conducting business through the school's accepted financial and accounting procedures. By doing so, adequate audit is always possible should the need arise.

a. Teachers will be allowed to purchase parts, at school cost, for live work. However, a purchase order must be obtained and given to the vendor when the order is placed.
b. Any items needed for the general operation of the shop programs or for instructional purposes must follow the usual procedure which includes administrative approval prior to ordering.

8. Customer Supplied Parts - For information concerning Customer Supplied Parts, check individual departmental policies.

9. What Work or Jobs May be Accepted

a. Individual instructors may only accept work from technical school staff and students. Other live work is subject to the approval of the Director.
b. All live work must enhance the students' current training activities.

10. How Work or Jobs Will Be Received

Every live production job will be written up on the official school work order form at the time the job is accepted. This work order is to show what instructor accepted the job, the customer's name, address, telephone number, and the nature of the work to be performed.

11. Financial Responsibility

All work is on a cash and carry basis. So far as possible, the customer should be given a fair estimate of his possible expenditure before the work begins. After work has begun and investigation reveals the cost will exceed your estimate by $10 or more, the customer should be consulted and his O.K. obtained before proceeding. By all means, the customer is to understand he must pay all charges due before receiving his goods. Any work delivered without being paid for will become the instructor's liability.

12. Prices to Charge

a. In cases where there are parts and materials used in performing the work, they are to be charged to the customer at school cost.

b. In cases where there are no parts or materials, the instructor should charge the established flat rate to cover incidental items such as rags, solvent, tape, etc. Flat rate will be established annually during September after recommendation by the instructor and approval by the Director.

SMALL ENGINE MECHANICS CURRICULUM STRUCTURE

(Alternative 1)

Course Number	Course	Clock Hours
	First Quarter	
	Related Instruction (Safety, Science, Math, Theory, etc.)	66
	Small Engine Service:	
	Fuel Systems	26
	Ignition Systems	18
	Starting Systems	14
	Charging Systems	28
	Exhaust Systems	16
	Laboratory Hours (live work)	144
		312
	Second Quarter	
	Small Engine Service:	
	Valve Overhaul	24
	Cylinder Overhaul (4-cycle)	24
	Cylinder Overhaul (2-cycle)	24
	Engine Overhaul (diesel)	44
	Engine Overhaul (heavy duty)	40
	Laboratory Hours (live work)	156
		312
	Third Quarter	
	Equipment Repair:	
	Lawnmower Assemblies	24
	Tiller Assemblies	34
	Chain Saw Assemblies	82
	Laboratory Hours (live work)	172
		312
	Fourth Quarter	
	Outboard Marine:	
	Power Head	72
	Lower Unit	50
	Boat and Trailer	75
	Laboratory Hours (live work)	115
		312

SMALL ENGINE MECHANICS CURRICULUM STRUCTURE

(Alternative 2)

Course Number	Course	Clock Hours
	First Quarter	
	Small Engine Service:	
	Fuel Systems	78
	Ignition Systems	18
	Starting Systems	14
	Charging Systems	28
	Exhaust Systems	24
	Laboratory Hours (live work)	144
		306
	Second Quarter	
	Small Engine Service:	
	Valve Overhaul	24
	Cylinder Overhaul (4-cycle)	30
	Cylinder Overhaul (2-cycle)	24
	Engine Overhaul (diesel)	44
	Engine Overhaul (heavy duty)	40
	Laboratory Hours (live work)	156
		318
	Third Quarter	
	Equipment Repair:	
	Lawnmower Assemblies	24
	Tiller Assemblies	34
	Chain Saw Assemblies	82
	Laboratory Hours (live work)	172
		312
	Fourth Quarter	
	Outboard Marine:	
	Power Head	72
	Lower Unit	50
	Boat and Trailer	75
	Laboratory Hours (live work)	115
		312

COURSE OUTLINE

The following sample quarter system outline is to be used as an example to facilitate the development of alternative outlines for the individual learner. The listing of major blocks within a quarter is not to indicate a sequenced pattern. All duty areas are independent except for the listed prerequisites or related instruction tasks, therefore, a group of students should begin the quarter by learning different tasks. This allows better coordination of the lab hours and the learning objectives may be selected according to the type of "live" projects or equipment available.

The time estimations for completion of the activities are based on opinions of several small engine instructors and published data. The estimates are a minimum amount of time required and should be extended according to the learner's individual needs. The additional laboratory hours is an approximation of the amount of time the student should spend on live work projects. A complete explanation of live work is contained in the curriculum structure introduction.

Small Engine Mechanics Suggested Course Outline

Quarter I

Unit/Task	Title	Classroom & Lab hours:minutes
	Related Instruction	
RI-01	Demonstrating and utilizing school and lab policies and procedures	2:00
RI-02	Maintaining a parts inventory	2:00
RI-03	Reading and interpreting the shop service manuals	2:00
RI-04	Completing job work order forms	2:00
RI-05	Identifying and maintaining shop tools and equipment	10:00
RI-06	Using precision measurement tools and equipment	6:00
RI-07	Demonstrating engine theories of operation	6:00
RI-08	Demonstrating a knowledge of electricity fundamentals	6:00
RI-09	Demonstrating a knowledge of fuels	2:00
RI-10	Demonstrating a knowledge of lubricants	2:00
RI-11	Demonstrating a knowledge of hardware and fasteners	2:00
RI-12	Demonstrating basic metal operations	6:00
RI-13	Demonstrating welding and soldering techniques	6:00
RI-14	Demonstrating a knowledge of applied mathematics	6:00
RI-15	Demonstrating a knowledge of applied science	6:00
		66:00
	MAJOR BLOCK: SMALL ENGINE SERVICE	
	Duty I - Service, Maintain and Repair the Fuel System	
SE-01	Servicing the fuel tank, fuel lines and fuel filter	2:00
SE-02	Servicing the air cleaner	2:00
SE-03	Adjusting fuel/air mixtures and mechanical linkage	2:00
SE-04	Reconditioning the float-type carburetor	4:00
SE-05	Reconditioning the suction-lift-type carburetor	4:00
SE-06	Reconditioning the diaphragm-type carburetor	4:00
SE-07	Reconditioning fuel pumps	2:00
SE-08	Repairing and adjusting governors	2:00

SE-09	Diagnosing fuel system problems	4:00
		26:00

Duty II - Service, Maintain and Repair the Ignition System

SE-10	Inspecting, selecting and installing spark plugs	2:00
SE-11	Timing the ignition system	2:00
SE-12	Testing, removing and replacing magneto ignition components	4:00
SE-13	Testing, removing and replacing battery ignition components	2:00
SE-14	Testing, removing and replacing electronic ignition components	4:00
SE-15	Diagnosing ignition system problems	4:00
		18:00

Duty III - Service, Maintain and Repair the Starting System

SE-16	Inspecting and repairing the rope-type starting system	4:00
SE-17	Inspecting and repairing the wind-up starting system	2:00
SE-18	Inspecting and repairing electric-type starting system	4:00
SE-19	Diagnosing starting system problems	4:00
		14:00

Duty IV - Service, Maintain and Repair the Charging System

SE-20	Testing and servicing storage batteries and battery packs	6:00
SE-21	Testing and repairing DC generators and components	6:00
SE-22	Testing and repairing AC generators and components	6:00
SE-23	Testing and repairing the combination generator/starter and components	6:00
SE-24	Diagnosing charging system problems	4:00
		28:00

Duty V - Service, Maintain and Repair the Exhaust and Emission Control System

SE-25	Removing and replacing mufflers and exhaust pipes	4:00

SE-26	Cleaning 2-cycle exhaust systems	4:00
SE-27	Maintaining emission control devices	4:00
SE-28	Diagnosing exhaust and emission control systems problems	4:00
		16:00
	Quarter I Total Classroom Hours:	168:00
	Quarter I Additional Laboratory Hours:	144:00
	Total Quarter I Hours	312:00

Quarter II

Unit/Task	Title	Classroom & Lab hours:minutes
	MAJOR BLOCK: SMALL ENGINE SERVICE	
	Duty VI - Recondition Cylinder Head and Valves	
SE-29	Checking valve operation	2:00
SE-30	Grinding valves and valve seats	6:00
SE-31	Inspecting and repairing the cylinder head	4:00
SE-32	Adjusting valve clearances	4:00
SE-33	Repairing 2-cycle engine valves	4:00
SE-34	Diagnosing valve problems	4:00
		24:00
	Duty VII - Recondition Cylinder, Cylinder Block and Components of Air-Cooled 4-Cycle Gas Engines	
SE-35	Inspecting and measuring wear condition	4:00
SE-36	Disassembling and inspecting component parts	8:00
SE-37	Reassembling and replacing component parts	8:00
SE-38	Diagnosing 4-cycle engine problems	4:00
		24:00
	Duty VIII - Recondition Cylinders, Cylinder Block and Components of Air-Cooled 2-Cycle Gas Engines	
SE-39	Inspecting and measuring wear condition	4:00
SE-40	Disassembling and inspecting component parts	8:00
SE-41	Reassembling and replacing component parts	8:00
SE-42	Diagnosing 2-cycle engine problems	4:00
		24:00
	Duty IX - Recondition Cylinder, Cylinder Block and Components of Air-Cooled Single Cylinder Diesel Engines	
SE-43	Inspecting and measuring wear condition	8:00
SE-44	Disassembling and inspecting component parts	8:00

SE-45	Reassembling and replacing component parts	12:00
SE-46	Testing and reconditioning of fuel injection system	12:00
SE-47	Diagnosing single cylinder diesel engine problems	4:00
		44:00

Duty X - Recondition Cylinder, Cylinder Block and Components of Small Engines Greater than 12 Horsepower

SE-48	Inspecting and measuring wear condition	8:00
SE-49	Disassembling and inspecting component parts	8:00
SE-50	Reassembling and replacing component parts	12:00
SE-51	Testing and reconditioning of fuel system components	4:00
SE-52	Testing and renewing ignition system components	4:00
SE-53	Diagnosing problems in multi-cylinder engines	4:00
		40:00
	Quarter II Total Classroom Hours:	156:00
	Quarter II Additional Laboratory Hours:	156:00
	Total Quarter II Hours:	312:00

Quarter III

Unit/Task	Title	Classroom & Lab hours:minutes
	MAJOR BLOCK: EQUIPMENT REPAIR	
	Duty I - Service and Maintain Lawnmower Assemblies	
ER-01	Inspecting the assembly	2:00
ER-02	Sharpening and balancing the blade	2:00
ER-03	Adjusting and replacing the wheels	2:00
ER-04	Cleaning and lubricating the assembly	2:00
ER-05	Inspecting and replacing drive mechanisms	4:00
ER-06	Repairing frame damage	4:00
ER-07	Installing a short block assembly	8:00
		24:00
	Duty II - Service and Maintain Garden Tiller Assemblies	
ER-08	Inspecting the assembly	2:00
ER-09	Cleaning and lubricating the assembly	2:00
ER-10	Adjusting and replacing wheels	2:00
ER-11	Inspecting and repairing the controls and drive mechanism	16:00
ER-12	Repairing frame damage	4:00
ER-13	Installing a short block assembly	8:00
		34:00
	Duty III - Service and Maintain Chain Saw Assemblies	
ER-14	Handling the chain saw safely	2:00
ER-15	Identifying the component parts	4:00
ER-16	Servicing the assembly	4:00
ER-17	Maintaining bar, chain and clutch	8:00
ER-18	Testing, removing and replacing ignition system components	8:00
ER-19	Reconditioning the carburetor and fuel system components	8:00
ER-20	Repairing the starting system	4:00
ER-21	Disassembling and inspecting the power unit	20:00
ER-22	Reassembling the power unit	20:00
ER-23	Diagnosing chain saw problems	4:00
		82:00

Quarter III Total Classroom Hours:	140:00
Quarter III Additional Laboratory Hours:	172:00
Total Quarter III Hours:	312:00

Quarter IV

Unit/Task	Title	Classroom & Lab hours:minutes
	MAJOR BLOCK: OUTBOARD MARINE ENGINE REPAIR	
	Duty I - Recondition Outboard Motor Power Head Assemblies	
ME-01	Identifying the component parts	6:00
ME-02	Testing, removing and replacing magneto ignition system components	10:00
ME-03	Testing, removing and replacing electronic ignition system components	10:00
ME-04	Removing the power head from the lower unit	6:00
ME-05	Reconditioning the carburetor and fuel system components	10:00
ME-06	Disassembling and inspecting the power head	10:00
ME-07	Reassembling the power head	10:00
ME-08	Testing the motor in the tank	4:00
ME-09	Making final adjustments	2:00
ME-10	Diagnosing problems in the outboard power head	4:00
		72:00
	Duty II - Rebuild Outboard Motor Lower Unit Assemblies	
ME-11	Identifying the component parts	4:00
ME-12	Replacing propellers	2:00
ME-13	Inspecting and replacing the water pump and component parts	6:00
ME-14	Disassembling and inspecting gear drive assembly	6:00
ME-15	Reassembling the gear drive	10:00
ME-16	Mounting the lower unit to the power head	4:00
ME-17	Mounting the motor on the boat	4:00
ME-18	Making control adjustments	4:00
ME-19	Diagnosing problems in the lower unit	4:00
ME-20	Winterizing and storing the outboard motor	6:00
		50:00

Duty III - Service, Maintain and Repair the Boat Trailer

ME-21	Installing motor controls	10:00
ME-22	Installing steering mechanism	20:00
ME-23	Installing marine accessories	10:00
ME-24	Making fiberglass repairs	10:00
ME-25	Placing the boat on the trailer	5:00
ME-26	Repairing trailer lighting	5:00
ME-27	Repairing the trailer frame	10:00
ME-28	Replacing wheel bearings	5:00
		75:00
	Quarter IV Total Classroom Hours	197:00
	Quarter IV Additional Laboratory Hours	115:00
	Total Quarter IV Hours	312:00

SECTION V

UNIT GUIDES

UNIT GUIDES

Description

In this section the tasks to be taught in each course are presented in sequential order. Each task is listed on a separate page so that it may be taken out of the guide for daily lesson planning or regrouped with other tasks to fit the individual teacher's own preference for teaching order. The task pages may be used for planning and executing group instruction or for individualized instruction. Each page in the UNIT GUIDES section contains the following information:

TASK: This is a short and concise statement of the task to be taught.

PERFORMANCE OBJECTIVE: The performance expected of the student after completing the unit is stated in stem form, without a specific statement of all conditions, equipment, and performance standard (these are listed in a criterion referenced measure in the Evaluation section of the task page).

INSTRUCTIONAL ACTIVITIES: Suggested learning activities are presented. These activities include providing information, demonstration, practical applications, and related instruction.

INSTRUCTIONAL MATERIALS: The materials that are necessary to carry out the instructional activities are listed. These include textbooks, audio-visuals and equipment. Textbooks are referenced by author with the title of the book contained in the textbook list in the

Instructional Resource section. In the event of more than one textbook per author then the textbook reference will be numbered.

EVALUATION: This section contains a criterion referenced measure and reference to any test items or other evaluation measures that are available to the teacher. V'TECS catalogs are cross referenced to each program task by task number.

CLASSROOM HOURS: The estimated time for completion of the instructional activities and the evaluation are indicated. This time estimate is stated in hours of classroom time but also includes shop hours.

RELATED INSTRUCTION: For each program task there are Related Instruction tasks (RI-01 through RI-15) which will provide the learner with a strong foundation contributing to successful completion of each program task. Related Instruction can be taught during the first 66 hours of the quarter or as each individual task is presented. The latter option allows almost immediate hands on experiences. If the Related Instruction tasks are taught in conjunction with the program tasks then the instructional time must be increased accordingly. Related instruction pertaining to each task is outlined on each unit guide sheet under the Instructional Activities section. Also, there is a Program Tasks/Related Instruction Matrix at the beginning of this section that cross references Related Instruction tasks to Program tasks.

PROGRAM TASKS			**RELATED INSTRUCTION**														
SMALL ENGINE			01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
I.	Fuel System	SE-01	X	X	X		X				X		X				
		SE-02	X	X	X		X										
		SE-03	X		X				X		X		X				X
		SE-04	X	X	X		X	X			X		X			X	X
		SE-05	X	X	X		X				X		X				X
		SE-06	X	X	X		X				X		X				X
		SE-07	X	X	X		X				X		X				X
		SE-08	X	X	X		X		X				X				X
		SE-09	X		X	X	X		X		X						X
II.	Ignition System	SE-10	X	X	X		X			X							
		SE-11	X		X		X	X	X	X							X
		SE-12	X	X	X		X	X	X	X			X				
		SE-13	X	X	X		X	X	X	X			X				
		SE-14	X	X	X		X	X	X	X			X				
		SE-15	X		X	X	X		X	X							X
III.	Starting System	SE-16	X	X	X		X						X				
		SE-17	X	X	X		X						X				
		SE-18	X	X	X		X			X			X				
		SE-19	X		X	X	X		X	X							
IV.	Charging System	SE-20	X		X	X	X			X			X				
		SE-21	X	X	X		X			X			X				
		SE-22	X	X	X		X			X			X				
		SE-23	X	X	X		X			X			X				
		SE-24	X		X	X	X			X							
V.	Exhaust System	SE-25	X	X	X		X						X	X			
		SE-26	X		X		X		X				X				
		SE-27	X	X	X		X		X		X						X
		SE-28	X		X	X	X		X		X	X					X
VI.	Recondition Valves	SE-29	X		X		X		X								
		SE-30	X		X		X	X					X			X	

PROGRAM TASKS		**RELATED INSTRUCTION**														
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	SE-31	X		X		X	X					X	X		X	
	SE-32	X		X		X	X	X				X			X	
	SE-33	X	X	X		X	X	X				X				
	SE-34	X		X	X	X		X				X			X	X
VII. Recondition Cylinder Block (4-Cycle)	SE-35	X		X		X	X								X	
	SE-36	X		X		X	X	X				X		X	X	
	SE-37	X	X	X		X					X	X				
	SE-38	X		X	X	X		X		X					X	X
VIII. Recondition Cylinder Block (2-Cycle)	SE-39	X		X		X	X								X	
	SE-40	X		X		X	X	X				X		X	X	
	SE-41	X	X	X		X					X	X				
	SE-42	X		X	X	X		X		X					X	X
IX. Recondition Cylinder Block (Diesel)	SE-43	X		X		X	X	X							X	X
	SE-44	X		X		X	X	X	X	X	X	X			X	X
	SE-45	X	X	X		X		X	X	X	X	X			X	X
	SE-46	X		X		X	X	X		X		X			X	X
	SE-47	X		X	X	X	X	X	X	X	X	X			X	X
X. Recondition Cylinder Block (12-Horsepower & greater)	SE-48	X		X		X	X	X								
	SE-49	X		X		X	X	X	X	X	X	X			X	X
	SE-50	X	X	X		X		X	X	X	X	X			X	X
	SE-51	X		X		X	X	X		X		X				
	SE-52	X	X	X		X			X			X				
	SE-53	X		X	X	X	X	X	X	X	X	X			X	X

PROGRAM TASKS		RELATED INSTRUCTION														
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
EQUIPMENT REPAIR																
I. Lawnmower Assemblies	ER-01	X		X		X						X				
	ER-02	X		X		X						X	X			
	ER-03	X	X	X		X					X	X				
	ER-04	X		X		X					X					
	ER-05	X	X	X		X					X					X
	ER-06	X		X		X						X	X	X		
	ER-07	X	X	X	X	X				X	X	X				
II. Tiller Assemblies	ER-08	X		X		X						X				
	ER-09	X		X		X						X	X			
	ER-10	X	X	X		X					X	X				
	ER-11	X	X	X		X					X					
	ER-12	X		X		X						X	X	X		
	ER-13	X	X	X	X	X				X	X	X				
III. Chain Saw Assemblies	ER-14	X														X
	ER-15	X	X	X				X	X	X	X	X				
	ER-16	X		X		X				X	X	X				
	ER-17	X		X		X						X			X	X
	ER-18	X	X	X		X			X			X				
	ER-19	X	X	X		X				X		X			X	X
	ER-20	X	X	X		X		X				X				
	ER-21	X		X		X	X	X	X	X	X	X			X	X
	ER-22	X	X	X		X	X	X	X	X	X	X			X	
	ER-23	X		X	X		X	X	X	X	X	X			X	X

PROGRAM TASKS		RELATED INSTRUCTION														
		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
OUTBOARD MARINE ENGINE REPAIR																
I. Power Head	ME-01	X	X	X				X								
	ME-02	X	X	X		X		X	X			X			X	
	ME-03	X	X	X		X		X	X			X			X	
	ME-04	X		X		X							X			
	ME-05	X	X	X		X	X			X		X				
	ME-06	X		X		X	X					X	X		X	
	ME-07	X	X	X		X	X					X			X	
	ME-08	X		X		X		X								
	ME-09	X		X		X	X					X			X	
	ME-10	X		X	X	X		X	X	X					X	X
II. Lower Unit	ME-11	X	X	X				X								
	ME-12	X	X	X		X						X	X			X
	ME-13	X	X	X		X	X					X	X		X	X
	ME-14	X		X		X	X				X	X				X
	ME-15	X	X	X		X	X					X			X	X
	ME-16	X		X		X						X				
	ME-17	X		X		X						X			X	X
	ME-18	X		X		X						X				
	ME-19	X		X	X	X		X	X		X					X
	ME-20	X		X		X				X	X					
III. Boat & Trailer	ME-21	X	X	X	X	X						X				
	ME-22	X	X	X		X						X	X			
	ME-23	X	X	X		X						X	X			
	ME-24	X		X		X										
	ME-25	X		X												X
	ME-26	X		X		X			X			X		X		
	ME-27	X		X		X						X	X	X		
	ME-28	X	X	X		X					X	X				

TASK

RI-01 Demonstrating and utilizing school and shop policies and safety procedures

PERFORMANCE OBJECTIVE

Demonstrate an understanding of school and shop policies and procedures.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Program objectives
b. Career opportunities
c. Grading practices and procedures
d. Safety
e. Using audio visual equipment
f. Using the curriculum materials

Provide Demonstration On:

a. Using audio visual equipment
b. Using curriculum materials
c. Safe operating practices

Provide Practical Application On:

a. Safety practices
b. Using audio visual equipment
c. Using curriculum materials

INSTRUCTIONAL MATERIALS

Textbooks:

a. AAVIM, Developing Shop Safety Skills
b. Ohio State University

A/Vs:

a. AAVIM, "Developing Shop Safety Skills" (Slide set AV903)
b. Georgia Auto Mechanics Program (Slide sets 101-1, 2, 3, 4)

Student Manuals:

a. Georgia Auto Mechanics Program (101-1, 101-2, 101-3, 101-4)
b. School Policies (LEA)
c. AAVIM, Developing Shop Safety Skills (903 SW)

Tools and Equipment:

A/V equipment (Caramate, etc.)

CLASSROOM HOURS 2

EVALUATION (RI-01)

a. Given the necessary information and equipment, the learner will describe the objectives of the program, identify at least five career opportunities, demonstrate correct use of A/V equipment and student manuals and pass the safety exam with 90% accuracy.

b. Shop Safety, the Ohio State University, Trade and Industrial Education.

c. V'TECS, Small Engine Repair; Task No. 11

TASK

RI-02 Maintaining a parts inventory

PERFORMANCE OBJECTIVE

Identify, maintain and locate component parts using the parts manual.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Parts catalog
b. Microfiche readers
c. Parts request forms
d. Locating parts in storeroom
e. Maintaining stock
f. Storing parts
g. Identifying interchangeable parts
h. Posting the parts catalog

Provide Demonstration On:

a. Using the catalog
b. Using the reader
c. Looking up parts
d. Recording part numbers
e. Identifying interchangeable parts
f. Posting the parts catalog

Provide Practical Application On:

a. Looking up parts in the catalog and reader
b. Posting parts catalog

INSTRUCTIONAL MATERIALS

Textbooks:

GMC (Microfiche ED 022 971)

A/Vs:

Briggs & Stratton, Microfiche (Slide set MS-7192)

Tools and Equipment:

a. Microfiche reader
b. Parts catalog
c. Parts forms

CLASSROOM HOURS

2

EVALUATION (RI-02)

a. Given a model number and necessary parts catalog, the learner will identify a part specified by the instructor and locate the parts in the storage area with 100% accuracy.

b. V'TECS, Auto Parts Catalog; Performance Guides

c. V'TECS, Small Engine Repair; Task No. 6, 10, 14, 24, 25, 26

TASK

RI-03 Reading and interpreting the shop service manuals

PERFORMANCE OBJECTIVE

Identify procedures and specifications for tasks outlined in the service manual.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Necessary data required
b. Identifying the correct manual
c. Specification charts
d. Flat rate manuals
e. Updating the manual

Provide Demonstration On:

a. Locating data
b. Reading specification charts
c. Reading flat rate manuals
d. Posting the manual

Provide Practical Application On:

a. Identifying data
b. Using specification charts
c. Using flat rate manual
d. Posting the manual

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Data plate
b. Service manual
c. Flat rate manual

CLASSROOM HOURS 2

EVALUATION (RI-03)

Given a task and a model number, the learner will locate the task in the correct service manual and list the specifications required with 100% accuracy.

TASK

RI-04 Completing job work order forms

PERFORMANCE OBJECTIVE

Greet a customer and fill out the job work order form as per customer complaint.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Customer relations
b. Obtaining data
c. Filling out the form
d. Verifying the complaint
e. Maintaining records
f. Labor costs
g. Determining feasibility of repair

Provide Demonstration On:

a. Greeting customers
b. Acquiring pertinent information
c. Figuring cost

Provide Practical Application On:

a. Greeting customers
b. Filling out the form with necessary information
c. Figuring cost

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Repairable machine
b. Job work order forms
c. Parts catalog
d. Service of shop manual
e. Labor cost guide

CLASSROOM HOURS 2

EVALUATION (RI-04)

a. Given a customer complaint, job work order form and necessary information, the learner will complete the work order form and determine feasibility of repair.

b. V'TECS, Small Engine Repair; Task No. 8, 9, 12, 13, 20

TASK

RI-05 Identifying and maintaining shop tools and equipment

PERFORMANCE OBJECTIVE

Select the correct tool for a specific task and use in a safe manner.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Tool design
b. Tool use and selection
c. Storing equipment
d. Maintaining fire protection equipment
e. Repairing tools
f. Using cleaning equipment

Provide Demonstration On:

a. Selecting and using tools safely
b. Repairing tools
c. Fire codes
d. Using cleaning equipment

Provide Practical Application On:

a. Selecting and using tools
b. Using cleaning equipment
c. Repairing tools

INSTRUCTIONAL MATERIALS

Textbooks:

Crouse & Anglin

A/Vs:

a. Bergwall, "Automotive Hand Tools Explained" (Filmstrip)
b. Prentice-Hall, "Auto Mechanics Tools and Basic Skills" (Filmstrip)

Student Manuals:

MAVCC, Auto Mechanics of Small Engines Program

Tools and Equipment:

a. Discarded parts
b. Hand tools
c. Steam cleaner
d. Parts bath

CLASSROOM HOURS

10

EVALUATION (RI-05)

a. Given a specific task, the learner will select a tool and demonstrate safe and proper use according to job specifications.

b. V'TECS, Small Engine Repair; Task No. 27, 28

TASK

RI-06 Using precision measurement tools and equipment

PERFORMANCE OBJECTIVE

Measure clearances and wear allowances to .0001 of an inch of known value.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Measuring units
b. Plastigage
c. Micrometers
d. Calipers
e. Depth gauges
f. Timing tools

Provide Demonstration On:

a. Reading micrometers and calipers
b. Using plastigage
c. Using and reading depth gauges
d. Using and reading timing tools

Provide Practical Applications On:

a. Measuring tolerances requiring use of several different tools
b. Setting up timing tools

INSTRUCTIONAL MATERIALS

Textbooks:

Stovett

A/Vs:

a. Georgia Metal Fabrication Cluster (Slide set M-1)
b. Prentice Hall, "Machine Shop Bench Operations" (Filmstrip #2, 3)

Student Manuals:

Georgia Metal Fabrication Cluster (M-1)

Tools and Equipment:

a. Micrometers of various sizes
b. Vernier calipers
c. Plastigage
d. Discarded parts to measure
e. Timing tools
f. Engine for timing set-up

CLASSROOM HOURS 6

EVALUATION (RI-06)

Given an out of round crankshaft and necessary tools, equipment and specifications, the learner will determine usability of part according to the specifications.

TASK

RI-07 Demonstrating engine theories of opearation

PERFORMANCE OBJECTIVE

Identify and describe the purpose of each component of the gasoline and diesel engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Power terms
b. Parts and components
c. Principles of operation
d. Differences between gas and diesel engines

Provide Demonstration On:

a. Relationship of parts
b. Engine operation
c. Compare diesel and gas engines

Provide Practical Application On:

a. Identifying parts
b. Comparing diesel and gas engines

INSTRUCTIONAL MATERIALS

Textbooks:

a. AAVIM Vol. 1, 2
b. Briggs & Stratton
c. Glenn
d. Mitchell
e. Pipe
f. Stephenson
g. Stockel (1)
h. Brady

A/Vs:

a. Bergwall, "The Internal Combustion Engine Explained" (Filmstrip #1); The Four-Cycle Diesel Engine Explained: (Filmstrip)
b. Prentice-Hall, "The Basic Engine" (Filmstrip)

Tools and Equipment:

a. Engine cut-a-way (gas)
b. Engine cut-a-way (diesel)
c. Disassembled engine
d. Shop manuals

CLASSROOM HOURS

6

EVALUATION (RI-07)

Given necessary tools, equipment and engine parts, the learner will identify parts and components and list the operational sequences. This must be done with 80% accuracy.

TASK

RI-08 Demonstrate a knowledge of electricity fundamentals

PERFORMANCE OBJECTIVE

Utilize electrical fundamentals in constructing and testing circuits and computing Ohms law and power formulas.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Electron theory
b. Conductors & insulators
c. Generating and storing electricity
d. Ohms law and power formulas
e. Test meters
f. Circuits & schematics
g. Symbols
h. Solenoids, switches and motors

Provide Demonstration On:

a. Electron theory
b. Generating electricity
c. Wiring circuits
d. Using test motors
e. Testing electrical devices

Provide Practical Application On:

a. Wiring & testing circuits
b. Computing Ohms law and power formula
c. Testing electrical devices

INSTRUCTIONAL MATERIALS

Textbooks:

AAVIM, Understanding Electricity

A/Vs:

a. AAVIM, "Understanding Electricity and Electrical Terms" (Slide set S303; Transp. M303)
b. Prentice-Hall, "Basic Automotive Service" (Filmstrip #5); "Auto Mechanics Tools and Basic Skills" (Filmstrip #6)
c. Briggs & Stratton, "Custom VOA Meter" (Slide set MS-7346 & MS-7343); "Glossary of Electrical Terms" (Slide set MS-7174); "Electricity and Basic Electrical Terms" (Slide set MS-7204)

Tools and Equipment:

a. Wiring board
b. Test meters
c. Small electric devices

CLASSROOM HOURS 6

EVALUATION (RI-08)

a. Given a volt-ohmmeter, a schematic drawing and necessary tools and equipment, the learner will make the necessary wiring connections and record volts, ohms and amperage readings at five different points. All readings must be within 10% of known values.

b. Georgia Electro Mechanical Program, Teacher's Guide Volume IV.

TASK

RI-09 Demonstrating a knowledge of fuels

PERFORMANCE OBJECTIVE

Discriminate between types of fuels and match types with specific uses.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Safety
b. Properties of fuels
c. Selecting fuels
d. Storing and handling fuels

Provide Demonstration On:

Storing and handling fuels

Provide Practical Applications On:

Selecting and refueling an engine

INSTRUCTIONAL MATERIALS

Textbooks:

a. AAVIM, Selecting and Storing Fuels and Lubricants
b. Crouse (1)
c. Stockel (1)

A/Vs:

a. Shell Film Library
b. AAVIM, "Selecting and Storing Fuels and Lubricants" (Slide set S102; Transp, M102)

Student Manuals:

Tools and Equipment:

a. Fuels
b. Fuel containers

CLASSROOM HOURS 2

EVALUATION (RI-09)

Given a selection of fuels and an engine, the learner will refuel the engine with the correct fuel with 100% accuracy.

TASK

RI-10 Demonstrating a knowledge of lubricants

PERFORMANCE OBJECTIVE

List the properties of lubricants and select lubricants for specific jobs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Properties of lubricants
b. Selecting lubricants
c. Storing and handling lubricants
d. Cleaning lubricants (filters)

Provide Demonstration On:

a. Selecting lubricants
b. Wear due to lack of or dirty lubricants

Provide Practical Applications On:

Changing oil

INSTRUCTIONAL MATERIALS

Textbooks:

a. AAVIM, Small Engines Vol. I, II
b. Crouse (1)
c. Stockel (1)

Tools and Equipment:

a. Various types of oil
b. Various types of grease
c. Oil filters

CLASSROOM HOURS 2

EVALUATION (RI-10)

Given an automobile or small engine powered equipment, the learner will determine the proper lubricant for the engine and chassis. Selection of lubricants must meet manufacturer's specifications.

TASK

RI-11 Demonstrating a knowledge of hardware and fasteners

PERFORMANCE OBJECTIVE

Identify and install hardware and fasteners for specific jobs.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Identification of fasteners
b. Fastener grades
c. Sizing fasteners
d. Torque valves

Provide Demonstration On:

a. Selecting and installing fasteners
b. Tightening fasteners

Provide Practical Applications On:

Selecting and installing fasteners and hardware

INSTRUCTIONAL MATERIALS

Textbooks:

A/Vs:

Prentice-Hall, "Auto Mechanics Tools and Basic Skills" (Filmstrip #3)

Student Manuals:

Tools and Equipment:

a. Selection of fasteners
b. Torque wrenches
c. Sizing tools

(Other materials are available from local nut and bolt supply stores.)

CLASSROOM HOURS 2

EVALUATION (RI-11)

Given a selection of fasteners, the learner will select and install the fastener and tighten according to manufacturer's specifications.

TASK

RI-12 Demonstrating basic metals operations

PERFORMANCE OBJECTIVE

Construct a threaded steel block of given specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Cutting metals
b. Filing and grinding
c. Drilling holes
d. Making threads
e. Removing broken bolts and screws
f. Loosening seized parts
g. Installing threaded inserts

Provide Demonstration On:

a. Using hack saws and files
b. Selecting and using drills
c. Threading stock
d. Removing broken studs
e. Loosening seized parts
f. Installing threaded inserts

Provide Practical Applications On:

a. Constructing a threaded steel block
b. Making threaded studs

INSTRUCTIONAL MATERIALS

Textbooks:

A/Vs:

a. Georgia Transportation Cluster (Slide set HT 3-4)
b. Prentice-Hall, "Machine Shop: Bench Operations" (Filmstrip #2, 3)

Student Manuals:

Georgia Transportation Cluster (HT 3-5)

Tools and Equipment:

a. Metal cutting tools
b. Tap and die set
c. Drills and drill bits
d. Heat lamp or torch
e. Threaded insert kit

CLASSROOM HOURS 6

EVALUATION (RI-12)

Given necessary tools and equipment, the learner will construct a thread guage block and studs. All threaded holes must be at right angles to the gauge block and the studs must turn freely.

TASK

RI-13 Demonstrating welding and soldering techniques

PERFORMANCE OBJECTIVE

Cut and join two pieces of steel together using both gas and electric welding techniques.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Safety
b. Metal composition
c. Affects of heat
d. Flux and filler rods

Provide Demonstration On:

a. Electric welding
b. Gas welding/brazing
c. Cutting metal with a torch
d. Soldering

Provide Practical Applications On:

a. Cutting welding metals using both gas and electric welding equipment
b. Solder wiring using a soldering gun

INSTRUCTIONAL MATERIALS

Textbooks:

Althouse, et.al.

A/Vs:

a. Georgia Metal Fabrication Cluster (Slide sets BW-5; GC 1-5; GW 1-9
b. Scott, "Electric Welding" (closed loop film)
c. Delmar, "Basic Oxyacetylene Welding" (closed loop film)

Student Manuals:

Georgia Metals Fabrication Cluster: BW-5; GC 1-5; GW 1-9

Tools and Equipment:

a. Oxyacetylene outfit
b. Electric welding outfit
c. Soldering gun
d. Welding and soldering materials

CLASSROOM HOURS 6

EVALUATION (RI-13)

a. Given a gas welder and an electric welder, the learner will cut metal and perform a butt weld using each technique. Weld must conform to accepted practices. Given a soldering gun and equipment the learner will join two copper wires together in accordance with accepted practices.

b. Georgia Metal Fabrication Cluster, Pre/Post Checks.

TASK

RI-14 Demonstrating a knowledge of applied mathematics

PERFORMANCE OBJECTIVE

Establish and apply fundamental skills in mathematics to the automotive and transportation trade.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Whole numbers
b. Fractions
c. Decimal equivalents
d. Formulas
e. Ratio and proportion
f. Percentages and averages
g. Measurements

Provide Demonstration On:

Using mathematics for the mechanics trades

Provide Practical Applications On:

a. Determining cubic inch displacement and cubic centimeter displacement
b. Measuring and recording fractions in metric and English versions

INSTRUCTIONAL MATERIALS

Textbooks:

a. Georgia, Vocational Mathematics
b. Olivio
c. Wilton & Rogers

A/Vs:

Prentice-Hall, "Metrics for Auto Mechanics" (Filmstrip)

Student Manuals:

Georgia Transportation Mathematics for Vocational Students (SM.7.35)

Tools and Equipment:

a. Parts to be measured
b. 6 inch rule, micrometers, etc.

CLASSROOM HOURS

6

EVALUATION (RI-14)

Given an engine and necessary tools and equipment, the learner will determine the cubic inch and cubic centimeter displacement, calculate horse power and determine wear tolerances.

TASK

RI-15 Demonstrating a knowledge of applied science

PERFORMANCE OBJECTIVE

Identify principles of science as related to mechanical technology.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. History of the internal combustion engine
b. Work power and force
c. The lever and gear principles
d. Reducing friction
e. Heat characteristics
f. Gases and liquids
g. High and low pressures
h. Energy
i. Atoms and molecules

Provide Demonstration On:

a. Gear trains and levers
b. Bearing construction
c. Heat transfer
d. Liquid transfer
e. The venturi principle
f. Total engine operation

Provide Practical Applications On:

a. Construction of simple machines
b. Construction of electromagnets

INSTRUCTIONAL MATERIALS

Textbooks:

a. Crouse
b. Jensen
c. Pipe

A/Vs:

Student Manuals:

AAVIM, Ball and Roller Bearings (901)

Tools and Equipment:

a. Mock-up of gear train
b. Roller, needle and ball bearing
c. Engine cut-a-way

CLASSROOM HOURS

6

EVALUATION (RI-15)

Given the necessary tools and equipment, the learner will constru a simple machine and a gear reduction device to specifications. The learner will construct an electro-magnet and list the laws and principles of energy, magnetism and movement. This must be done with 80% accuracy.

TASK

SE-01 Servicing the fuel tank, fuel lines and fuel filter

PERFORMANCE OBJECTIVE

Remove, inspect and replace the fuel tank, fuel line and fuel filter.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Safety
b. Fuels
c. Fuel filters
d. Fuel lines
e. Fuel tanks

Provide Demonstration On:

a. Inspecting tank and lines for damage and contamination
b. Replacing tank & lines
c. Replacing fuel filters
d. Controlling contamination

Provide Practical Application On:

a. Inspecting, removing and replacing lines & tanks
b. Replacing fuel filters
c. Removing fuel tank contamination
d. Inspect condition of tank after cleaning

Related Instructions:

Tasks: RI-01-03; RI-09; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1

A/Vs:

AAVIM Vol. 1 & 2

Student Manuals:

a. Small Engines Workbook, Vol. 1 & 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Fuel containers

CLASSROOM HOURS 2

EVALUATION (SE-01)

a. Given a contaminated small engine fuel system, the learner will determine extent of contamination and/or damage and de-contaminate or repair. The fuel must flow freely into a test container and show no evidence of contamination or damage.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 1 & 2; Small Engines (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 29, 30

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-02 Servicing the air cleaner

PERFORMANCE OBJECTIVE

Determine type of air cleaner on engine and service it properly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of air cleaners
b. Importance of clean air cleaner
c. When to service

Provide Demonstration On:

Cleaning methods on various types of air cleaners

Provide Practical Application On:

a. Identifying several types of carburetor air cleaners
b. Inspection and cleaning of several types of air cleaners

Related Instruction:

Tasks: RI-01-03; RI-05

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Prentice-Hall, "Small Engine Service and Overhaul (Filmstrip #1)

Student Manuals:

a. Small Engine Workbook, Vol. 1 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Assorted types of air cleaners
b. Assorted hand tools
c. Shop manual
d. Various types of cleaning materials

CLASSROOM HOURS 2

EVALUATION (SE-02)

a. Given several types of carburetor air cleaners, the learner will identify them by type, clean properly, install on an engine and adjust to manufacturer's specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 1; Small Engines (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 31, 32, 33

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-03 Adjusting fuel/air mixtures and mechanical linkage

PERFORMANCE OBJECTIVE

Determine idle speed specifications from shop manual and using small engine tachometer adjust to meet specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Carburetor adjustment
b. Location of adjusting screws
c. Location of choke valve
d. Location of governor linkage

Provide Demonstration On:

a. Locating adjusting screws
b. Proper adjustment procedures

Provide Practical Application On:

a. Warming up engine and using tachometer to adjust the air fuel mixture for low speed, high speed and idle
b. Adjustment of governor linkages for proper advancement

Related Instruction:

Tasks: RI-01; RI-03; RI-09; RI-11; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Briggs & Stratton, "Checking Carburetor Systems" (Slide set MS-7164)
c. Bergwall, "Small Engines Explained" (Flimstrip #7)

Student Manuals:

a. Small Engines Workbook, Vol. 1 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Small engine tachometer

CLASSROOM HOURS

2

EVALUATION (SE-03)

a. Given a small engine, the learner will determine the specifications and after warm up, adjust the air/fuel mixture at low speed, high speed, and idle speed to meet these specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 40

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-04 Reconditioning the float type carburetor

PERFORMANCE OBJECTIVE

Remove, overhaul and replace the carburetor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Carburetor identification
b. Carburetor removal procedures
c. Proper disassembly and assembly techniques

Provide Demonstration On:

a. Float type carburetors in operation
b. Tear down and overhaul procedures

Provide Practical Application On:

a. Removing carburetor from engine
b. Disassembling the carburetor
c. Defining the basic parts and their function
d. Reassembling the carburetor

Related Instruction:

Tasks: RI-01-03; RI-05-06; RI-09; RI-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Roth
d. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Prentice-Hall, "Small Engine Service and Overhaul (Filmstrip 3#)
c. Lauson, "Carburetion Theory" (Slide set 693499A)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-7)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS

4

EVALUATION (SE-04)

a. Given a small engine with a defective float type carburetor, the learner will remove, disassemble, inspect, clean and adjust to manufacturer's specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook Volume 2 (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Tasks No. 36, 37, 40

e. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small engine with float type carburetor
b. Carburetor kit
c. Assorted hand tools
d. Carburetor cleaning fluid
e. Shop manual

TASK

SE-05 Reconditioning the suction-lift type carburetors

PERFORMANCE OBJECTIVE

Remove, overhaul and replace the carburetor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Carburetor identification
b. Carburetor removal procedures
c. Proper disassembly and assembly techniques

Provide Demonstration On:

a. Suction-lift carburetor in operation
b. Tear down and overhaul procedures

Provide Practical Application On:

a. Removing carburetor from engine
b. Disassembling the carburetor
c. Defining the basic parts and their functions
d. Reassembling the carburetor

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11 RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1 & 2

A/Vs:

a. AAVIM Vol. 2
b. Prentice-Hall, "Small Engine Service and Overhaul (Slide set #3)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-8)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Suction-lift carburetor
b. Carburetor kit
c. Assorted hand tools
d. Carburetor cleaning fluid
e. Shop manual

CLASSROOM HOURS

4

EVALUATION (SE-05)

a. Given a small engine with a defective suction-lift type carburetor, the learner will remove, disassemble, inspect, clean, reassemble and adjust to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 35

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-06 Reconditioning the diaphragm type carburetor

PERFORMANCE OBJECTIVE

Remove, overhaul and replace the carburetor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Carburetor identification
b. Carburetor removal procedures
c. Proper disassembly and assembly techniques

Provide Demonstration On:

a. Diaphragm type carburetors
b in operation
b. Tear down and overhaul procedures

Provide Practical Application On:

a. Removing carburetor from engine
b. Disassembling carburetor
c. Defining the basic parts and their functions
d. Reassembling the carburetor

Related Instruction:

Tasks: RI-01-03; RI-05; RI-09; RI-11; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1 & 2

A/Vs:

a. AAVIM Vol. 2
b. Prentice-Hall, "Small Engine Service and Overhaul" (Slide set #3)
c. Briggs & Stratton, "Pulsa Jet Carburetor" (Slide set MS-7162)
d. Lauson, "Carburetion Theory" (Slide set 693499A)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-9)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS

4

EVALUATION (SE-06)

a. Given a small engine with a diaphragm type carburetor, the learner will remove, disassemble, inspect and reassemble the carburetor.

b. Test questions available at end of chapter in Roth.

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. Georgia Transportation Cluster, Assignment Sheet SE-9.

e. V'TECS, Small Engine Repair; Task No. 34, 38

f. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Diaphragm type carburetor
b. Carburetor kit
c. Assorted hand tools
d. Carburetor cleaning fluid
e. Shop manual

TASK

SE-07 Reconditioning fuel pumps

PERFORMANCE OBJECTIVE

Remove, overhaul and replace the fuel pump

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Fuel pump construction
b. Fuel pump removal
c. Fuel pump repair

Provide Demonstration On:

a. Diaphragm type fuel pump operation
b. Tear down and overhaul procedure

Provide Practical Application On:

a. Removing fuel pump from engine
b. Disassembling and inspecting pump
c. Locating basic parts and tracing fuel flow through the pump

Related Instruction:

Tasks: RI-01-03; RI-05; RI-09; RI-11; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Stephensen
c. Turner, Vol. 2

A/Vs:

AAVIM Vol. 2

Student Manuals:

a. Small Engi[illegible] Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Fuel pump
b. Repair kit
c. Assoorted hand tools
d. Shop manual

CLASSROOM HOURS

2

EVALUATION (SE-07)

a. Given a small engine with a defective diaphragm type fuel pump, the learner will remove, disassemble, inspect and reassemble the pump. The pump output must be within manufacturer's specifications and show no sign of leaks.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 39

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-08 Repairing and adjusting governors

PERFORMANCE OBJECTIVE

Repair and/or adjust mechanical and pneumatic type governors.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Airvane governors
b. Centrifugal type governors

Provide Demonstration On:

Adjusting governing mechanisms

Provide Practical Application On:

a. Identifying type of governor
b. Inspecting governor and identifying various parts
c. Adjusting various governors and speeds

Related Instruction:

Tasks: RI-01-03; RI-05; RI-07 RI-11; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Bergwall, "Small Engines Explained" (Filmstrip #8)
c. Briggs & Stratton, "Governors" (Slide set MS-7200)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Small engine tachometer

CLASSROOM HOURS

2

EVALUATION (SE-08)

a. Given a small engine with a governor, the learner will determine type, inspect the governor for damage or freedom of movement and adjust to specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-09 Diagnosing fuel system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the fuel system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of fuel system problems
b. Testing sequence

Provide Demonstration On:

Procedures for diagnosing fuel problems

Provide Practical Application On:

a. Diagnosing fuel system problems
b. Repairing known problems

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07; RI-09; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Roth
d. Stephensen
e. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1 & 2
b. Briggs & Stratton, "Automatic Choke" (Slide set MS-7198); Checking Carburetor Systems" (Slide set MS-7164)
c. Lauson, "Carburetion Theory" (Slide set 603499A)

Student Manuals:

MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Assorted hand tools
b. Small engine
c. Shop manual
d. Small engine tachometer

CLASSROOM HOURS

4

EVALUATION (SE-09)

a. Given a small engine with a known problem, the learner will develop a troubleshooting plan and locate the problem with 100% accuracy.

b. MAVCC, Comprehensive Small Engine Repair

TASK

SE-10 Inspecting, selecting and installing spark plugs

PERFORMANCE OBJECTIVE

Select the correct spark plug to use in a given small engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Spark plug construction
b. Spark plug problems
c. Diagnosis information

Provide Demonstration On:

a. Spark plug types
b. Spark plug problem diagnosis
c. Spark plug cleaning
d. Spark plug installation

Provide Practical Application On:

a. Identifying spark plug problems
b. Identifying types of spark plugs
c. Tightening spark plugs with a torque wrench

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Prentice-Hall, "Small Engine Service and Overhaul" (Filmstrip #1)
c. Briggs & Stratton, "Spark Plug Blast Cleaning" (Slide set MS-7163)

Student Manuals:

a. Small Engine Workbook, Vol. 1 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small engines
b. Spark plug socket & ratchet
c. Torque wrench
d. Shop manual
e. Various types of spark plugs

CLASSROOM HOURS 2

EVALUATION (SE-10)

a. Given a small engine, the learner will remove, identify, inspect, clean and reinstall the spark plug and tighten to specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 64

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-11 Timing the ignition system

PERFORMANCE OBJECTIVE

Adjust the spark to occur at the right time in relation to piston travel and valve openings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of ignition systems
b. Various locations of timing adjustments

Provide Demonstration On:

a. Location of timing adjustment
b. Proper adjustment procedures

Provide Practical Application On:

a. Identifying types of ignition systems & determining specific design characteristics
b. Locating adjustment criteria and setting the timing

Related Instruction:

Tasks: RI-01; RI-03; RI-05-08; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Stephensen
c. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Lauson, "Ignition Theory" (Slide set 693498)

Student Manuals:

a. Small Engine Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Continuity light
d. Neon timing light
e. Shop manual
f. Feeler gauge
g. Timing (ring) gauge

CLASSROOM HOURS

2

EVALUATION (SE-11)

a. Given a small engine and necessary tools, the learner will identify the type of ignition system and make the necessary adjustments to meet given specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 71, 72

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-12 Testing, removing and replacing magneto ignition components

PERFORMANCE OBJECTIVE

Test, remove and replace magneto ignition components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Magneto ignition components
b. Ignition parts location and proper disassembly procedures
c. Component testing procedure

Provide Demonstration On:

a. Correct flywheel removal procedure
b. Component testing
c. Correct reassembly operation

Provide Practical Application On:

a. Disassembling necessary parts to locate ignition system
b. Identifying the component parts
c. Testing and replacing necessary parts
d. Reassembling engine
e. Making adjustment to specifications

Related Instruction:

Tasks: RI-01-03; RI-05-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 2

A/Vs:

a. Prentice-Hall, "Small Engine Service and Overhaul" (Filmstrip #2)
b. AAVIM Vol. 2
c. Briggs & Stratton, "New Ignition System" (Slide set MS-7166)
d. Lauson, Ignition Theory" (Slide set 693498)
e. Bergwall, "Small Engines Explained" (Filmstrip #6)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

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CLASSROOM HOURS

4

EVALUATION (SE-12)

a. Given a small engine with a malfunctioning magneto ignition system, the learner will locate the ignition system, remove, test, replace and adjust needed parts to restore engine to manufacturer's specifications.

b. Test questions available at end of chapter in Roth.

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS. Small Engine Repair; Task No. 65, 66, 67, 68, 69 70, 75

e. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine with magneto ignition
b. Assorted hand tools
c. Assorted small engine tools
d. Merc-o-tronic "98" ignition parts tester
e. Shop manual

TASK

SE-13 Testing, removing and replacing battery ignition components

PERFORMANCE OBJECTIVE

Test, remove and replace battery ignition components

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Battery ignition components
b. Ignition parts location
c. Component testing procedures
d. Adjustment locations and procedures
e. Battery safety

Provide Demonstration On:

a. Test instrument hook-up
b. Battery safety
c. Points adjustment and replacement
d. Coil replacement

Provide Practical Application On:

a. Identifying the component parts
b. Hooking up test instruments to determine condition
c. Removing and replacing points and condenser
d. Replacing secondary and primary wiring
e. Replacing coil

Related Instruction:

Tasks: RI-01-03; RI-05-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Lauson

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine with battery ignition
b. Assorted hand tools
c. Ignition tool kit
d. Timing light
e. Feeler gauge
f. Ohmmeter
g. Voltmeter
h. Shop manual

CLASSROOM HOURS 2

EVALUATION (SE-13)

a. Given a small engine with a malfunctioning battery ignition system, the learner will locate, test, replace and adjust needed parts to restore the engine to manufacturer's specifications.

b. Test question available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 65, 67, 69, 70, 72, 75

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-14 Testing, removing and replacing electronic ignition components

PERFORMANCE OBJECTIVE

Test, remove and replace electronic ignition system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of electronic ignition problems
b. Testing procedures

Provide Demonstration On:

a. Procedure for testing electronic ignition problems
b. Test equipment hook-up

Provide Practical Application On:

Repairing a known problem

Related Instruction:

Tasks: RI-01-03; RI-05-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 1

A/Vs:

a. Lauson, "Ignition Theory" (Slide set 693498)
b. AAVIM Vol. 2

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Continuity light
d. Ohmmeter
e. Brass feeler gauge set
f. Spark tester
g. Shop manual
h. Electronic tester (Merc-o-tronic)

CLASSROOM HOURS

4

EVALUATION (SE-14)

a. Given a small engine with a malfunctioning electronic ignition system, the learner will locate, test, replace and adjust needed parts to restore the engine to manufacturer's specifications.

b. Test questions available at end of chapter in Roth

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 65, 69, 70, 72, 73, 74, 75

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-15 Diagnosing ignition system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the ignition system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of ignition system problems
b. Testing sequence

Provide Demonstration On:

Procedures for diagnosing ignition problems

Provide Practical Application On:

a. Diagnosing an ignition system problem
b. Repairing the known problem

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07-08; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Roth
d. Stephensen
e. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Checking Ignition Systems" (Slide set MS-7165); "Troubleshooting" #1 & 2 (Slide sets MS-7188 & 7189)

Student Manuals:

MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Ohmmeter
e. Small engine tachometer
f. Voltmeter
g. Continuity light
h. Ignition tool kit

CLASSROOM HOURS 4

EVALUATION (SE-15)

a. Given a small engine with a known ignition problem, the learner will identify the problem and restore to specifications.

b. MAVCC, Comprehensive Small Engine Repair

TASK

SE-16 Inspecting and repairing the rope-rewind starting systems

PERFORMANCE OBJECTIVE

Remove and replace the component parts of the rope-rewind starter system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of starters using rope
b. Starter spring safety
c. Spring replacement
d. Rope replacement
e. Types of starter clutches

Provide Demonstration On:

a. Safe procedure for spring replacement
b. Rope replacement
c. Starter clutch cleaning and reassembly

Provide Practical Application On:

a. Replacing the spring
b. Replacing the rope
c. Cleaning or replacing the starter clutch assembly

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Disassemble-Inspect-Reassemble" (Slide set MS 7184)
c. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-10)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS 4

EVALUATION (SE-16)

a. Given a small engine with a rope-rewind starter, the learner will remove the starter assembly and replace the starter spring and rope to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 56, 57, 58, 59, 60, 61, 62, 63

d. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine with rope-rewind starter
b. Assorted hand tools
c. Shop manual

TASK

SE-17 Inspecting and repairing the wind-up starting systems

PERFORMANCE OBJECTIVE

Remove and replace the component parts of the wind-up starter system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Starter spring safety
b. Spring replacement
c. Clutch cleaning and replacement

Provide Demonstration On:

a. Safe procedure for spring replacement
b. Starter clutch cleaning and replacement

Provide Practical Application: On:

a. Replacing spring in wind-up starter
b. Replacing other components of the wind-up starter
c. Cleaning or replacing clutch assembly

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Disassemble-Inspect-Reassemble" (Slide set MS-7184)
c. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-11 and 12)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS

2

EVALUATION (SE-17)

a. Given a small engine with a wind-up starter, the learner will remove the starter assemble and replace needed components to restore operation to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 56, 57, 58, 59, 60, 61, 62

d. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine with wind-up starter
b. Assorted hand tools
c. Shop manual
d. Special tools

TASK

SE-18 Inspecting and repairing electric type starting systems

PERFORMANCE OBJECTIVE

Test, remove and repair the components of the starting system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of electric starting systems
b. Electrical safety
c. Battery safety
d. Wiring diagrams

Provide Demonstration On:

a. Electrical safety
b. Testing procedures
c. Show differences in starter-generator type, tractor type, automotive type, and alternator type

Provide Practical Application On:

a. Testing starting system components
b. Replacing starting system components
c. Testing wiring circuits
d. Replacing starter drives
e. Overhauling the starter assembly

Related Instruction:

Tasks: RI-01-03; RI-05; RI-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Gear Drive Starter Motors" (Slide set MS-7177)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-13)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS

4

EVALUATION (SE-18)

a. Given a small engine with a malfunctioning electric starting system, the learner will test, repair or replace the necessary components to restore the starting operation to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Georgia Transportation Cluster, Assignment Sheet SE-13.

d. V'TECS, Small Engine Mechanics; Task No. 55

e. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine with an electric starter
b. Shop manual
c. Assorted hand tools
d. Special tools
e. Battery tester
f. Voltmeter
g. Ammeter
h. Ohmmeter
i. Test light
j. Small engine tachometer

TASK

SE-19 Diagnosing starting system problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the starting system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of starting problems
b. Testing sequences

Provide Demonstration On:

Procedure for testing starting problems

Provide Practical Application On:

a. Diagnose a starting system problem
b. Repair the known starting problem

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07-08

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Nickel Cadmium" (Slide set MS 7178)

Student Manuals:

MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Small engine tachometer

CLASSROOM HOURS 4

EVALUATION (SE-19)

a. Given a small engine with a known starting problem, the learner will identify the problem and restore to specifications.

b. V'TECS, Small Engine Repair; Task No. 55

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-20 Testing and servicing storage batteries and battery packs

PERFORMANCE OBJECTIVE

Clean, test and charge storage batteries

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Battery safety
b. Battery construction
c. Battery care and cleaning
d. Battery charging
e. Battery testing (specific gravity voltage)

Provide Demonstration On:

a. Testing procedures
b. Battery care & cleaning
c. Battery charging

Provide Practical Application On:

a. Removing a battery, cleaning case and posts
b. Checking specific gravity
c. Checking voltage
d. Checking a battery

Related Instruction:

Tasks: RI-01; RI-03-05; RI-08 RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Roth
d. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Briggs & Stratton, "12 Volt Batteries" (Slide set MS 7195)
c. Georgia Transportation Cluster (Slide set TSB-1, TSB-2a & b, TSB-3-5)

Student Manuals:

a. Small Engines Workbook, Vol. 1 (AAVIM)
b. Georgia Transportation Cluster (TSB-1-5)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

continued on back

CLASSROOM HOURS

6

EVALUATION (SE-20)

a. Given a discharged storage battery, the learner will remove, clean, test and charge the battery. Determination of condition of battery will be based on manufacturer's specifications.

b. Use test question at end of chapter in Roth.

c. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 54

e. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Storage battery
b. Hydrometer
c. Battery tester
d. Battery post cleaner
e. Baking soda
f. Assorted hand tools
g. Shop manual
h. Battery clamp puller
i. Assorted brushes
j. Battery syringe

TASK

SE-21 Testing and repairing DC generators and components

PERFORMANCE OBJECTIVE

Test and repair a DC generator and voltage regulator

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of DC generators
b. DC generator components
c. Testing DC generator circuits
d. Servicing the DC generator
e. Current regulation

Provide Demonstration On:

a. Testing procedure
b. Disassembly & assembly procedure
c. Use of the growler
d. Use of the armature lathe
e. Adjusting the voltage regulator

Provide Practical Application On:

a. Removing a DC generator
b. Testing a DC generator
c. Disassembling and growler test
d. Machining comutator of armature
e. Replacing or adjusting voltage regulator

Related Instruction:

Tasks: RI-01-03; RI-05; RI-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Turner, Vol. 2

A/Vs:

AAVIM Vol. 2

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-13)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

continued on back

CLASSROOM HOURS

6

EVALUATION (SE-21)

a. Given a small engine with a defective DC charging system, the learner will test and diagnose unit and make necessary repairs to restore system to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53

d. MAVCC, Comprehensive Small Engine Repair

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine with a DC charging system
b. Voltmeter
c. Ammeter
d. Ohmmeter
e. Growler
f. Armature lathe
g. Shop manual
h. Assorted hand tools

TASK

SE-22 Testing and repairing AC generators and components

PERFORMANCE OBJECTIVE

Test and repair an AC generator and voltage regulator

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Alternator components
b. Types of alternator systems
c. Testing instruments
d. Testing procedures
e. Voltage regulation
f. Charging circuits

Provide Demonstration On:

a. Testing procedures
b. Disassembly & assembly procedures
c. AC system circuits
d. Adjusting voltage regulators

Provide Practical Application On:

a. Testing an AC generator system
b. Replacing alternator components
c. Replacing or adjusting regulators

Related Instruction:

Tasks: RI-01-03; RI-05; RI-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Alternator Theory" (Slide set MS 7193); "Alternator Systems Update" (Slide set MS-7210)
c. Lauson, "Alternators" (Slide set 694521)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine with AC generator
b. Assorted hand tools
c. AC voltmeter
d. DC voltmeter
e. Shop manual

CLASSROOM HOURS 6

EVALUATION (SE-22)

a. Given a small engine with a defective AC charging system, the learner will test and diagnose unit and make necessary repairs to restore system to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-23 Testing and repairing the combination generator/starter and components

PERFORMANCE OBJECTIVE

Test and repair the combination generator/starter system

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Combination generator/ starter components
b. Types of combined systems
c. Testing instruments
d. Testing procedures
e. Voltage regulation
f. Charging circuits

Provide Demonstration On:

a. Testing procedure
b. Disassembly & assembly procedure
c. Combination generator/ starter circuits

Provide Practical Application On:

a. Testing a combination generator/starter procedure
b. Replacing components
c. Replacing or adjusting the voltage regulator

Related Instruction:

Tasks: RI-01-03; RI-05; RI-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "12 Volt Starter-Generator" (Slide set MS 7176)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, *Comprehensive Small Engine Repair*

Tools and Equipment:

a. Small gas engine with generator/starter
b. Shop manual
c. Assorted hand tools

CLASSROOM HOURS

6

EVALUATION (SE-23)

a. Given a small engine with a defective generator/starter combination, the learner will test and diagnose unit and make necessary repairs to restore system to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-24 Diagnosing charging system problems

PERFORMANCE OBJECTIVE

Develop a diagnostic plan that will lead to the discovery and cause of problems.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of systems
b. System components
c. Safety
d. Testing instruments
e. Testing procedure

Provide Demonstration On:

a. Proper instrument connections
b. Testing procedures
c. Formulating a plan

Provide Practical Application On:

Developing a workable plan for testing a small engine charging system

Related Instruction:

Tasks: RI-01; RI-03-05; RI-08

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Alternator Troubleshooting" (Slide set MS 7194)
c. Lauson, "Alternator" (Slide set 694521)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Shop manual
c. Assorted hand tools
d. Testing instruments

CLASSROOM HOURS

4

EVALUATION (SE-24)

a. Given a small engine with a defective charging system, the learner will develop a plan for diagnosing the system, locate the malfunction and replace and make the necessary repairs. The trouble shooting plan must locate the cause of the problem in the most efficient way possible.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 48

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-25 Removing and replacing mufflers and exhaust pipes

PERFORMANCE OBJECTIVE

Remove and replace mufflers and exhaust pipes on small engines.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Safety
b. Types of exhaust components
c. Component removal procedures
d. Special procedures for loosening siezed parts

Provide Demonstration On:

a. Safe work habits
b. Broken exhaust bolt or stud removal

Provide Practical Application On:

a. Removing and replacing an exhaust system component
b. Removing and replacing a broken exhaust bolt or stud

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11-12

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Purvis
c. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Briggs & Stratton, "Noise Control" (Slide set MS 7191)

Student Manuals:

a. Small Engines Workbook, Vol. 1 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Shop manual
c. Assorted hand tools
d. Special exhaust tools

CLASSROOM HOURS

4

EVALUATION (SE-25)

a. Given a small engine with an exhaust problem, the learner will locate the trouble and replace faulty components in accordance with manufacturer's specifications.

b. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-26 Cleaning 2-cycle exhaust systems

PERFORMANCE OBJECTIVE

Clean and inspect a 2-cycle engine exhaust ports

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. 2-cycle exhaust components
b. Cleaning procedures
c. Type of tools needed
d. Types of mufflers

Provide Demonstration On:

a. Methods of cleaning exhaust ports
b. Muffler replacement

Provide Practical Application On:

Removing muffler and cleaning and inspecting the exhaust port

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-07; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 1

A/Vs:

a. AAVIM Vol. 1
b. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engine Workbook, Vol. 1 (AAVIM)
b. MAVCC, *Comprehensive Small Engine Repair*

Tools and Equipment:

a. Small 2-cycle engine
b. Assorted hand tools
c. Solvents
d. Special exhaust tools
e. Wooden scraper

CLASSROOM HOURS

4

EVALUATION (SE-26)

a. Given a small 2-cycle engine, the learner will remove the muffler, clean exhaust port and replace the muffler according to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-27 Maintaining emission control devices

PERFORMANCE OBJECTIVE

Test, service or replace the emission control system on 2 and 4-cycle engines.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of emission controls
b. Adaptations for small engines
c. Testing devices
d. Maintenance

Provide Demonstration On:

a. Use of testing devices
b. Testing procedure
c. Adaptation to small engines

Provide Practical Application On:

Servicing a small engine with emission controls

Related Instruction:

Tasks: RI-01-03; RI-05; RI-07; RI-09 RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Crouse & Anglin (2)
b. Pipe

Student Manuals:

MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engines
b. Shop manual
c. Assorted hand tools
d. Emission control test equipment
e. Vacuum gauge

CLASSROOM HOURS 4

EVALUATION (SE-27)

a. Given a small engine with excessive emissions, the learner will service the system and restore to industry standards.

b. V'TECS, Small Engine Repair; Task No. 41

TASK

SE-28 Diagnosing exhaust and emission control system problems

PERFORMANCE OBJECTIVE

Develop a diagnostic plan for locating problems in the small engine emission control system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Components of the emission control system
b. Exhaust problems
c. Dangers of carbon monoxide
d. Ventilation for operation of an engine inside a building

Provide Demonstration On:

a. Use of test equipment
b. How to look for emission or exhaust problems

Provide Practical Application On:

a. Develop and use a troubleshooting plan

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07; RI-09-10; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Crouse & Anglin (2)
b. Purvis
c. Turner, Vol. 1

A/Vs:

AAVIM Vol. 1

Student Manuals:

a. Small Engines Workbook, Vol. 1 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Shop manual
c. Assorted hand tools
d. Assorted test equipment for emission control
e. Vacuum gauge

CLASSROOM HOURS 4

EVALUATION (SE-28)

a. Given an engine with a known exhaust or emission problem, the learner will diagnose the problem and repair as necessary to restore minimum accepted emissions.

b. AAVIM Student Workbook, Volume 1; (answers in Teacher Guide)

c. Georgia Automotive Emission Controls; Teacher Guide

TASK

SE-29 Checking valve operation

PERFORMANCE OBJECTIVE

Inspecting and adjusting valves

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Valve system components
b. Valve types
c. Valve timing
d. Compression testing
e. Valve component inspection
f. Valve adjustment

Provide Demonstration On:

a. Compression testing procedures
b. Valve clearance inspection
c. Valve adjustment

Provide Practical Application On:

a. Checking compression on engine
b. Checking valve clearance
c. Adjusting valve clearances

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-07

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Valve and Seat Reconditioning" (Slide set MS 7167)
c. Bergwall, "Small Engines Explained" (Filmstrip #3)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (4-cycle)
b. Shop manual
c. Assorted hand tools
d. Compression tester

CLASSROOM HOURS

2

EVALUATION (SE-29)

a. Given a small gas engine, the learner will check compression and valve clearance. The valves must be adjusted to manufacturer's specifications.

b. Questions at end of chapter in Roth

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair, Task No. 84

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-30 Grinding valves and valve seats

PERFORMANCE OBJECTIVE

Inspect valves, seats and valve guides for wear and restore to specifications.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Valve removal
b. Types of valve retainers
c. Valve guide inspection
d. Use of valve grinder
e. Valve inspection
f. Valve cleaning

Provide Demonstration On:

a. Valve inspection for burning or warpage
b. Seat inspection
c. Valve guide inspection for wear
d. Grinding valves
e. Grinding seats
f. Lapping valves

Provide Practical Application On:

a. Remove cylinder head
b. Remove valves
c. Clean and inspect valves
d. Grind valves on grinder
e. Grind seats
f. Lap valves in and adjust

Related Instruction:

Tasks: RI-01; RI-03; RI-05-06; RI-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Valve and Seat Reconditioning" (Slide set MS 7167)
c. Prentice-Hall, "Small Engine Service and Overhaul" (Filmstrip #5)
d. Bergwall, "Small Engines Explained" (Filmstrip #3)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, *Comprehensive Small Engine Repair*

Tools and Equipment:

a. Small gas engine
b. Shop manual
c. Assorted hand tools
d. Valve grinding machine
e. Special valve tools

CLASSROOM HOURS

6

EVALUATION (SE-30)

a. Given a 4-cycle gas engine, the learner will clean, inspect, grind and lap the valves and seats. All measurements must meet manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 84, 85, 86

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-31 Inspecting and repairing the cylinder head

PERFORMANCE OBJECTIVE

Inspect and repair cylinder head

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of cylinder heads
b. Repairing mating surfaces
c. Removing broken bolts and studs

Provide Demonstration On:

a. Valve removal
b. Cylinder head inspection
c. Repair of warped head
d. Removal of a broken stud or bolt

Provide Practical Application On:

a. Removing cylinder head and inspecting for damage
b. Removing valves
c. Repairing mating surface

Related Instruction:

Tasks: RI-01; RI-03; RI-05-06; RI-11-12; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

AAVIM Vol. 2

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine
b. Assorted hand tools
c. Shop manual
d. Sand paper

CLASSROOM HOURS	4

EVALUATION (SE-31)

a. Given a small engine with a damaged cylinder head, the learner will restore the head to manufacturer's standards.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 87, 88

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-32 Adjusting valve clearances

PERFORMANCE OBJECTIVE

Adjust valve clearances on small gas engines

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Methods for checking and adjusting clearance
b. Replacement and retorquing head bolts
c. Tightening sequences

Provide Demonstration On:

a. Adjusting by grinding stem
b. Adjusting with an adjustment screw

Provide Practical Application On:

a. Adjust valves with adjustable tappets
b. Adjust valves without the use of adjustable tappets

Related Instruction:

Tasks: RI-01; RI-03; RI-05-07; RI-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Valve and Seat Reconditioning" (Slide set MS 7167)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, *Comprehensive Small Engine Repair*

Tools and Equipment:

a. Small gas engine (4-cycle)
b. Shop manual
c. Assorted hand tools
d. Feeler gauge
e. Valve stem grinder
f. Torque wrench

CLASSROOM HOURS

4

EVALUATION (SE-32)

a. Given a small engine needing a valve adjustment, the learner will adjust the valves to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-33 Repairing 2-cycle engine valves

PERFORMANCE OBJECTIVE

Inspect, remove, clean and replace 2-cycle engine reed valves

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of reed valves
b. Inspection of reed valves
c. Replacement of reed valves
d. Diagnosing symptoms

Provide Demonstration On:

a. Inspecting 2-cycle valves
b. Cleaning reed valves

Provide Practical Application On:

a. Removing reed valve assembly of 2-cycle engine
b. Cleaning and inspecting reed valve assembly
c. Replacing reed valve assembly

Related Instruction:

Tasks: RI-01-03; RI-05-07; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (2-cycle)
b. Shop manual
c. Steel rule
d. Wooden scraper
e. Feeler gauge
f. Cleaning solvent

CLASSROOM HOURS 4

EVALUATION (SE-33)

a. Given a small gas engine (2-cycle), the student will remove, clean, inspect and replace the reed valve assembly in accordance with manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-34 Diagnosing valve problems

PERFORMANCE OBJECTIVE

Develop a diagnostic plan for locating problems in the valve train.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Diagnostic procedures
b. Inspection techniques
c. Symptoms analysis

Provide Demonstration On:

a. Compression testing
b. Inspection procedures

Provide Practical Application On:

a. Diagnosing and repairing a 4-cycle small engine
b. Diagnosing and repairing a 2-cycle valve system

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07; RI-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Troubleshooting" #2 (Slide set MS 7189)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, *Comprehensive Small Engine Repair*

Tools and Equipment:

a. Small gas engine
b. Shop manual
c. Assorted hand tools
d. Compression tester

CLASSROOM HOURS 4

EVALUATION (SE-34)

a. Given a small engine with a valve train malfunction, the learner will develop a trouble-shooting plan and use it to locate the problem and repair engine to manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-35 Inspecting and measuring wear condition (4-cycle engine)

PERFORMANCE OBJECTIVE

Measure the cylinder block, piston, crankshaft and components for excessive wear.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Inspection procedure
b. Areas of wear
c. Types of wear
d. Measurement procedures
e. Types of measuring instruments
f. Cylinder condition diagnosis & analysis

Provide Demonstration On:

a. Cylinder measurement
b. Measuring instruments
c. Position of measurement
d. Cylinder condition diagnosis & analysis

Provide Practical Application On:

a. Cleaning & inspecting an engine block assembly
b. Measuring cylinder wear
c. Measuring crankshaft for out of round
d. Measuring other components for wear

Related Instruction:

Tasks: RI-01; RI-03; RI-05-06; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Stephensen
d. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Prentice-Hall, "Small Engine Service and Overhaul (Filmstrip #4)
c. Briggs & Stratton, "Disassemble-Inspect-Reassemble" (Slide set MS 7184)
d. Lauson, "Engine" (Slide set 690141F)
e. Bergwall, "Small Engines Explained" (Filmstrip #3)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

continued on back

CLASSROOM HOURS 4

EVALUATION (SE-35)

a. Given a small engine assembly, the learner will clean, inspect, measure and determine the overall condition of the block and cylinder area. All measurements must be within .002" of known condition.

b. Test questions at end of chapter in Roth.

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 76, 78, 80, 81, 82

e. MAVCC, Comprehensive Small Engine Repair

INSTURCTIONAL MATERIALS

Tools and Equipment:

a. Small engine block and components
b. Shop manual
c. Assorted hand tools
d. Inside and outside micrometer
e. Cylinder gauge
f. Telescoping gauge
g. Cleaning solvent
h. Air nozzle
i. Parts brush

TASK

SE-36 Disassembling and inspecting component parts (4-cycle engine)

PERFORMANCE OBJECTIVE

Disassemble the 4-cycle engine, inspect component parts and prepare the block.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Disassembling procedure
b. Inspection procedure
c. Engine component parts
d. Critical wear areas
e. Types of bearings used
f. Need for deglazing cylinder and removing ridge

Provide Demonstration On:

a. Correct disassembly procedure
b. Inspection for critical wear
c. Measuring for critical wear
d. Deglazing and ridge reaming

Provide Practical Application On:

a. Disassembling a small engine
b. Cleaning parts of small engine
c. Inspecting and reporting condition of component parts and block
d. Deglazing block and removing cylinder ridge

Related Instruction:

Tasks: RI-01; RI-03; RI-05-07; RI-11; RI-13-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Disassemble-Inspect-Reassemble" (Slide set MS 7184)
c. Lauson, "Engine" (Slide set 690141F)
d. Prentice-Hall, "Small Engine Service and Overhaul" (Filmstrip #4, 5)
e. Bergwall, "Small Engines Explained" (Flimstrip #2, 4)

Student Manuals:

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CLASSROOM HOURS 8

EVALUATION (SE-36)

a. Given a small 4-cycle engine, the learner will disassemble engine, clean and inspect component parts and determine any areas of critical wear. Inspection and measurement must be within 5% of known condition.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

d. V'TECS, Small Engine Repair, Task No. 76, 79, 80, 81, 82, 101

INSTRUCTIONAL MATERIALS

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-3)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (4-cycle)
b. Shop manual
c. Cleaning solvent
d. Micrometer set
e. Parts brush
f. Air nozzle
g. Assorted hand tools
h. Cylinder hone
i. Ridge reamer

TASK

SE-37 Reassembling and replacing component parts (4-cycle engine)

PERFORMANCE OBJECTIVE

Reassemble the 4-cycle engine

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Reassembly procedures
b. Specifications
c. Fitting component parts together
d. Proper part alignment

Provide Demonstration On:

a. Specification manual
b. Using a torque wrench
c. Parts alignment
d. Measuring clearances

Provide Practical Application On:

Assembling small engine using necessary replacement parts

Related Instruction:

Tasks: RI-01-03; RI-05; RI-07; RI-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Disassemble-Inspect-Reassemble" (Slide set MS 7184)
c. Lauson, "Engine" (Slide set 690141F)
d. Prentice-Hall, "Small Engine Service and Overhaul (Filmstrip #6)
e. Bergwall, "Small Engines Explained" (Filmstrip #5)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. Georgia Transportation Cluster Student Manual (SE-4)
c. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

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CLASSROOM HOURS

8

EVALUATION (SE-37)

a. Given a 4-cycle engine with all necessary parts, the learner will assemble the engine according to manufacturer's specifications. The engine must start easily and operate within the standards set by the manufacturer.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, *Small Engine Repair*; Task No. 76, 77, 78, 79, 80, 81, 82, 83, 89

d. MAVCC, *Comprehensive Small Engine Repair*

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small gas engine (4-cycle)
b. Shop manual
c. Assorted hand tools
d. Torque wrench
e. Ring compressor
f. Ring expander
g. Engine seals and gaskets

TASK

SE-38 Diagnosing 4-cycle engine problems

PERFORMANCE OBJECTIVE

Develop a comprehensive troubleshooting plan to cover the entire engine.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Diagnosis procedures
b. Problems analysis

Provide Demonstration On:

Comprehensive diagnosis

Provide Practical Application On:

Diagnosing engine problems using troubleshooting plan

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Briggs & Stratton, "Engine Analysis" (Slide set MS 7169); "Troubleshooting 8000 and 92000 Series Engine" (Slide set MS 7183); "Troubleshooting #3 (Slide set MS 7190)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (4-cycle)
b. Assorted hand tools
c. Assorted test instruments

CLASSROOM HOURS 4

EVALUATION (SE-38)

a. Given a 4-cycle gas engine with a known problem, the learner will develop a troubleshooting plan, locate the problem and the cause. The plan must conform to accepted industry practices.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-39 Inspecting and measuring wear condition (2-cycle engine)

PERFORMANCE OBJECTIVE

Measure the cylinder, block, piston, crankshaft and components for excessive wear.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Inspection procedure
b. Areas of wear
c. Types of wear
d. Types of measuring instruments
e. Cylinder condition diagnosis & analysis

Provide Demonstration On:

a. Cylinder measurement
b. Measuring instruments
c. Positions of measurements
d. Cylinder condition diagnosis & analysis

Provide Practical Application On:

a. Cleaning and inspecting an engine block assembly
b. Measuring cylinder wear
c. Measuring crankshaft for out of round
d. Measuring other components for wear

Related Instruction:

Tasks: RI-01; RI-03; RI-05-06; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (2-cycle)
b. Shop manual
c. Assorted hand tools
d. Inside micrometer
e. Cylinder gauge
f. Telescoping gauge
g. Outside micrometer
h. Cleaning solvent
i. Air nozzle
j. Parts brush

CLASSROOM HOURS 4

EVALUATION (SE-39)

a. Given a 2-cycle engine, the learner will clean, inspect, measure and determine the overall condition of the block and cylinder assembly.

b. Test questions at end of chapter in Roth pertaining to 2-cycle engines

c. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

d. V'TECS, Small Engine Repair; Task No. 76, 80, 81, 82

e. MAVCC, Comprehensive Small Engine Repair

TASK

SE-40 Disassembling and inspecting component parts (2-cycle)

PERFORMANCE OBJECTIVE

Disassemble the 2-cycle engine and inspect component parts

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Disassembling procedure
b. Inspection procedure
c. Engine design
d. Types of engine bearings
e. Critical wear areas
f. Piston differences

Provide Demonstration On:

a. Correct disassembling procedure
b. Inspection for critical wear
c. Measuring for critical wear

Provide Practical Application On:

a. Disassembling a small engine
b. Cleaning parts of small engine
c. Inspecting and reporting condition of component parts

Related Instruction:

Tasks: RI-01; RI-03; RI-05-07; RI-11; RI-13-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (2-cycle)
b. Shop manual
c. Assorted hand tools
d. Cleaning solvent
e. Parts brush
f. Air nozzle
g. Micrometer

CLASSROOM HOURS 8

EVALUATION (SE-40)

a. Given a small 2-cycle engine, the learner will disassemble engine, clean and inspect component parts and determine any areas of critical wear. Inspection and measurement must be within 5% of known condition.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 76, 80, 81, 82

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-41 Reassembling and replacing component parts (2-cycle)

PERFORMANCE OBJECTIVE

Reassemble the 2-cycle engine

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Reassembly procedures
b. Specifications
c. Fitting component parts together
d. Proper parts alignment
e. Operational differences

Provide Demonstration On:

a. Specification manuals
b. Using a torque wrench
c. Parts alignment
d. Measuring clearances

Provide Practical Application On:

Assembling small engine using necessary replacement parts

Related Instruction:

Tasks: RI-01-03; RI-05; RI-10-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Turner, Vol. 2

A/Vs:

a. AAVIM Vol. 2
b. Lauson, "Engine" (Slide set 690141F)

Student Manuals:

a. Small Engines Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (2-cycle)
b. Shop manual
c. Assorted hand tools
d. Torque wrench
e. Engine seals and gaskets

CLASSROOM HOURS

8

EVALUATION (SE-41)

a. Given a 2-cycle small engine with all necessary parts, the learner will assemble the engine according to manufacturer's specifications. The engine must start easily and operate within the standards set by the manufacturer.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. V'TECS, Small Engine Repair; Task No. 76, 77, 79, 80, 81, 82, 83, 89

d. MAVCC, Comprehensive Small Engine Repair

TASK

SE-42 Diagnosing 2-cycle engine problems

PERFORMANCE OBJECTIVE

Develop a comprehensive troubleshooting plan to cover the entire engine.

INSTRUCTIONAL ACTIVITIES

Provide Informatin On:

a. Diagnosis procedures
b. Problems analysis

Provide Demonstration On:

Comprehensive diagnosis

Provide Practical Application On:

Diagnosing known engine problems using troubleshooting plan

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07; RI-09; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Pipe
b. Roth
c. Turner, Vol. 2

A/Vs:

AAVIM Vol. 2

Student Manuals:

a. Small Engine Workbook, Vol. 2 (AAVIM)
b. MAVCC, Comprehensive Small Engine Repair

Tools and Equipment:

a. Small gas engine (2-cycle)
b. Assorted hand tools
c. Assorted test instruments
d. Vacuum gauge

CLASSROOM HOURS

4

EVALUATION (SE-42)

a. Given a small 2-cycle engine with a known problem, the learner will develop a trouble-shooting plan and locate the problem and the cause. The plan must conform to accepted industry practices.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. MAVCC, Comprehensive Small Engine Repair

TASK

SE-43 Inspecting and measuring wear condition (small diesel engine)

PERFORMANCE OBJECTIVE

Measure the cylinder block, piston, crankshaft and components for excessive wear.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-35 through SE-38

Provide Information On:

a. Inspection procedure
b. Areas of wear
c. Types of wear
d. Measurements procedures
e. Types of measuring instruments
f. Cylinder condition diagnosis and analysis

Provide Demonstration On:

a. Cylinder measurement
b. Measuring instruments
c. Position of measurement
d. Cylinder condition diagnosis and analysis

Provide Practical Application On:

a. Cleaning and inspecting an engine block assembly
b. Measuring cylinder wear
c. Measuring crankshaft for out of round
d. Measuring other components for wear

(continued on back)

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Single cylinder diesel engine (i.e. Hatz or Deutz
b. Shop manual
c. Assorted hand tools
d. Inside and outside micrometers
e. Cylinder gauge
f. Telescoping gauge
g. Form for recording data

CLASSROOM HOURS	8

EVALUATION (SE-43)

Given a single cylinder diesel engine and necessary tools and equipment, the learner will clean, inspect, measure and determine the overall condition of the block, cylinder and components. All measurements must be within .002" of known conditions.

INSTRUCTIONAL ACTIVITIES (continued)

Related Instruction

Tasks: RI-01; RI-03; RI-05-07; RI-14-15

TASK

SE-44 Disassembling and inspecting component parts (small diesel engine)

PERFORMANCE OBJECTIVE

Disassemble the single cylinder diesel engine, inspect component parts and prepare the block.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-35 through SE-38

Provide Information On:

a. Disassembling procedure
b. Inspection procedure
c. Engine component parts
d. Critical wear areas
e. Types of bearings used
f. Need for deglazing cylinder and removing ridge

Provide Demonstration On:

a. Correct disassembly procedure
b. Inspection for critical wear
c. Measuring for critical wear
d. Deglazing and ridge reaming

Provide Practical Application On:

a. Disassembling a small diesel engine
b. Cleaning parts of small diesel engine
c. Inspecting and reporting condition of component parts and block
d. Deglazing block and removing cylinder ridge

Related Instruction:

Tasks: RI-01; RI-03; RI-05-11; RI-14-15

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Single cylinder small diesel
b. Shop manual
c. Hand tools
d. Pullers

CLASSROOM HOURS 8

EVALUATION (SE-44)

Given a single cylinder diesel engine and necessary tools and equipment, the learner will disassemble engine, clean and inspect component parts and determine any areas of critical wear. Inspection and measurement must be within 5% of known conditions.

TASK

SE-45 Reassembling and replacing component parts (small diesel engine)

PERFORMANCE OBJECTIVE

Reassemble the small diesel engine.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-35 through SE-38

Provide Information On:

a. Reassembly procedures
b. Specifications
c. Fitting component parts together
d. Proper part alignment

Provide Demonstration On:

a. Specification manual
b. Using a torque wrench
c. Parts alignment
d. Measuring clearances

Provide Practical Application On:

Assembling small engine using necessary replacement parts

Related Instruction:

Tasks: RE-01-03; RI-05; RI-07-11; RI-14-15

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Disassemble small diesel engine (i.e. Deutz or Hatz single cylinder)
b. Manufacturer's shop manual
c. Tools

CLASSROOM HOURS 12

EVALUATION (SE-45)

Given a small diesel engine with all necessary parts, tools and equipment, the learner will assemble the engine according to manufacturer's specifications. The engine must start easily and operate within the standards set by the manufacturer.

TASK

SE-46 Testing and reconditioning of fuel injection system (small diesel engine)

PERFORMANCE OBJECTIVE

Remove, test and replace the fuel injection pump and injector.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-35 through SE-38

Provide Information On:

a. Diesel fuels
b. Fuel filters
c. Fuel injection system
d. Injection pump (jerk pump)
e. Injection nozzles
f. Cleanliness
g. Safety
h. Injection timing
i. Injector test equipment
j. Opening pressure
k. Leakage
l. Spray pattern
m. Engine governing systems

Provide Demonstration On:

Removing, testing and replacing the injector

Provide Practical Application On:

Removing, testing and replacing the injector on an automotive diesel engine

Related Instruction:

Tasks: RI-01; RI-03; RI-05-07; RI-09; RI-11; RI-14-15

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Different types of pumps and injectors
b. Pump and injector test equipment
c. Shop manual

CLASSROOM HOURS 12

EVALUATION (SE-46)

Given a single cylinder diesel engine and necessary tools and equipment, the learner will remove and replace the fuel injection pump and injector. The learner will evaluate the serviceability of the injector with 100% accuracy and reinstall according to manufacturer's specifications.

TASK

SE-47 Diagnosing single cylinder diesel engine problems

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the single cylinder diesel engine.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Diesel fuel system diagnoses
b. Diesel electrical system diagnoses
c. Diesel exhaust system diagnoses
d. Diesel cooling system diagnoses
e. Diesel valve train diagnoses
f. Internal engine noises

Provide Demonstration On:

Locating engine misfire or low power due to fuel system and/or air intake problems

Provide Practical Application On:

Developing a diagnostic plan and applying it to an engine with known problems

Related Instruction:

Tasks: RI-01; RI-03-11; RI-14-15

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Small diesel engine
b. Test equipment
c. Hand tools
d. Manufacturer's manual and/or troubleshooting chart

CLASSROOM HOURS	4

EVALUATION (SE-47)

Given a small diesel engine with a known problem and necessary tools and equipment, the learner will locate the malfunction and repair according to manufacturer's specifications.

TASK

SE-48 Inspecting and measuring wear condition (heavy duty small engines)

PERFORMANCE OBJECTIVE

Measure the cylinder block, piston, crankshaft and components for excessive wear.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 throught SE-38

Provide Information On:

a. Inspection procedure
b. Areas of wear
c. Types of wear (aluminum block vs. cast iron)
d. Measurement procedures
e. Types of measuring instruments
f. Cylinder condition diagnosis and analysis

Provide Demonstration On:

a. Cylinder measurement
b. Measuring instruments
c. Position of measurement
d. Cylinder condition diagnosis and analysis

Provide Practical Application On:

a. Cleaning and inspecting an engine block assembly
b. Measuring cylinder wear
c. Measuring crankshaft for out of round
d. Measuring other components for wear

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INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

a. Briggs & Stratton, "Twin Cylinder Engines" (Slide set MS-7205)
b. Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip WK-1195)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Engine block and components
b. Shop manual
c. Assorted hand tools
d. Inside and outside micrometer
e. Cylinder gauge
f. Telescoping gauge

CLASSROOM HOURS

8

EVALUATION (SE-48)

a. Given an engine assembly and the necessary tools and equipment, the learner will clean, inspect, measure and determine the overall condition of the block and cylinder area. All measurements must be within .002" of known condition.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

INSTRUCTIONAL ACTIVITIES

Related Instruction:

Tasks: RI-01; RI-03; RI-05-07

TASK

SE-49 Disassembling and inspecting component parts (heavy duty small engines)

PERFORMANCE OBJECTIVE

Disassemble the heavy duty small engine, inspect component parts and prepare the block.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Disassembling procedure
b. Inspection procedure
c. Engine component parts
d. Critical wear areas
e. Types of bearings used
f. Need for deglazing cylinder and removing ridge

Provide Demonstration On:

a. Correct disassembly procedure
b. Inspection for critical wear
c. Measuring for critical wear
d. Deglazing and ridge reaming

Provide Practical Application On:

continued on back

INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

a. Briggs & Stratton, "Twin Cylinder Engines" (Slide set MS-7205)
b. Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip WK-1195)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Heavy duty small engine
b. Shop manual
c. Hand tools
d. Puller set
e. Micrometer set
f. Special tools required by manufacturer
g. Ridge reamer
h. Cylinder hone

CLASSROOM HOURS 8

EVALUATION (SE-49)

a. Given a heavy duty small engine and necessary tools and equipment, the learner will disassemble engine, clean and inspect component parts and determine any areas of critical wear. Inspection and measurement must be within 5% of known condition and in accordance with manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

a. Disassembling a heavy duty small engine
b. Cleaning parts of a heavy duty small engine
c. Inspecting and reporting condition of component parts and block
d. Deglazing block and removing cylinder ridge

Related Instruction:

Tasks: RI-01; RI-03; RI-05-11; RI-14-15

TASK

SE-50 Reassembling and replacing component parts (heavy duty small engines)

PERFORMANCE OBJECTIVE

Reassemble the heavy duty small engine.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Reassembly procedures
b. Specifications
c. Fitting component parts together
d. Proper part alignment

Provide Demonstration On:

a. Specification manual
b. Using a torque wrench
c. Parts alignment
d. Measuring clearances

Provide Practical Application On:

Assembling small engine using necessary replacement parts

Related Instruction:

Tasks: RI-01-03; RI-05; RI-07-11

INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip WK-1195)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Disassembled heavy duty small engine
b. Shop manual
c. Hand tools
d. Torque wrench
e. Ring compressor
f. Gasket set and replacement parts
g. Special manufacturer's tools

CLASSROOM HOURS 12

EVALUATION (SE-50)

a. Given a 4-cycle engine with all necessary parts, the learner will assemble the engine according to manufacturer's specifications. The engine must start easily and operate within the standards set by the manufacturer.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

TASK

SE-51 Testing and reconditioning of fuel system

PERFORMANCE OBJECTIVE

Remove, overhaul and replace the carburetor and fuel pump.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Carburetor identification
b. Carburetor and fuel pump principles of operation
c. Proper disassembly and assembly techniques

Provide Demonstration On:

a. Linkage adjustment
b. Float adjustment
c. Replacing fuel pump valves
d. Proper cleaning

Provide Practical Application On:

Remove, overhaul and replace carburetor and fuel pump.

Related Instruction:

Tasks: RI-01; RI-03-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip WK-1198)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Heavy duty small engine
b. Hand tools
c. Shop manual
d. Carburetor cleaner

CLASSROOM HOURS

4

EVALUATION (SE-51)

a. Given a heavy duty small gas engine and necessary tools and equipment, the learner will remove, overhaul and replace the carburetor and fuel pump. Upon completion of task, the carburetor and fuel pump must operate within manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

TASK

SE-52 Testing and renewing ignition system components (heavy duty small gas engine)

PERFORMANCE OBJECTIVE

Test and renew ignition system components.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Battery ignition
b. Magneto ignition (impulse and flywheel)
c. Electronic ignition
d. Components
e. Timing

Provide Demonstration On:

a. Gapping and setting points and plugs
b. Timing ignition

Provide Practical Application On:

Have learner perform a major tune-up on a heavy duty small gas engine.

Related Instruction:

RI-01-03; RI-05; RI-08; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip WK-1197)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Heavy duty small gas engine
b. Shop manual
c. Hand tools
d. Various ignition components
e. Special manufacturer's tools

CLASSROOM HOURS

4

EVALUATION (SE-52)

a. Given a heavy duty small gas engine and necessary tools and equipment, the learner will perform a major tune-up. The engine ignition system must perform within manufacturer's specifications.

b. AAVIM Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

TASK

SE-53 Diagnosing problems in multi-cylinder gas engines

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the heavy duty small gas engine.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-38

Provide Information On:

a. Ignition system diagnosis
b. Fuel system diagnosis
c. Electrical and starting system diagnosis
d. Using compression tester (wet or dry methods)
e. Checking for mechanical problems
f. Spark plug diagnosis

Provide Demonstration On:

Formulating a troubleshooting plan for a given engine

Provide Practical Application On:

Developing a troubleshooting plan and using it to find engine malfunctions

Related Instruction:

Tasks: RI-01; RI-03-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

Drake

A/Vs:

Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip XF-1194)

Student Manuals:

AAVIM, Small Engines, Vol. 2

Tools and Equipment:

a. Compression tester
b. Hand tools
c. Troubleshooting chart
d. Timing light
e. VOM meter

CLASSROOM HOURS 4

EVALUATION (SE-53)

a. Given a heavy duty small gas engine with a known problem and necessary tools and equipment, the learner will develop a troubleshooting plan, locate the problem and make necessary repairs to restore engine to manufacturer's specifications.

b. AAVIM, Student Workbook, Volume 2; (answers in Teacher Guide)

c. Textbook study questions

TASK

ER-01 Inspecting the assembly

PERFORMANCE OBJECTIVE

Inspect the mower assemlby for correct and safe operating condition.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of mower decks
b. Types of deck wheels
c. Throttle cables
d. Checking engine oil
e. Checking for bent shaft
f. Inspecting blades and clutch
g. Checking out self-propel mechanism

Provide Demonstration On:

a. Checking for wheel shaft wear
b. Checking for bent crank shaft
c. Inspecting for self-drive problems
d. Safe procedures

Provide Practical Application On:

a. Distinguishing types of decks
b. Inspecting drive mechanism
c. Checking engine oil
d. Inspecting throttle cables

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Technical Publications, (1)(2)
b. Turner, Vol. 2

Student Manuals:

a. MAVCC, Lawn and Garden Equipment Repair
b. AAVIM, Small Engines Student Workbook, Vol. 2

Tools and Equipment:

a. Hand tools
b. Shop manual
c. Engine with bent crank shaft

CLASSROOM HOURS 2

EVALUATION (ER-01)

a. Given a lawnmower assembly and necessary tools and equipment, the learner will inspect mower deck, drive mechanism, engine oil, throttle cable, mower blade and check for bent crank shaft. All unsafe conditions must be identified.

b. V'TECS, Small Engine Repair; Task No. 96

c. AAVIM, Small Engine Repair Student Workbook

d. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-02 Sharpening and balancing the blade

PERFORMANCE OBJECTIVE

Remove, sharpen, balance and replace mower blade.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Removal of mower blade
b. Grinding of blade tips
c. Using a bench grinder
d. Blade balancers
e. How to balance blade
f. Blade inspection and rejection
g. Blade installation

Provide Demonstration On:

a. Safety precautions
b. Proper grinding of blade tips
c. Balancing blade
d. Blade installation

Provide Practical Application On:

a. Removing mower blade
b. Grinding blade
c. Balancing blade
d. Replacing blade

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11-12

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (1)(2)

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Bench grind[illegible]
c. Blade balancer

CLASSROOM HOURS

2

EVALUATION (ER-02)

a. Given a lawnmower and necessary tools and equipment, the learner will remove the blade, inspect for servicability, sharpen the blade tips, balance and install the blade. All defects must be noted and the sharpened and balanced blade must conform to manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 93

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-03 Adjusting and replacing the wheels

PERFORMANCE OBJECTIVE

Adjust and replace the wheels.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Special types of bolts
b. Types of adjuster plates
c. Measuring blade height
d. Lubricating wheels

Provide Demonstration On:

a. Safety
b. Types of axle bolts
c. Equal adjustment of wheels
d. Measurement of blade height

Provide Practical Application On:

a. Removing and replacing wheels
b. Adjusting wheel height
c. Measuring blade cut
d. Lubricating wheels

Related Instruction:

Tasks: RI-01-03; RI-05; RI-10-11

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (1)(2)

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Measuring device

CLASSROOM HOURS 2

EVALUATION (ER-03)

a. Given a lawnmower and necessary tools and equipment, the learner will remove and install new wheels, adjust height of wheels and measure for proper cutting height. This shall be done in a safe manner and cutting height should be within 1/2" of that requested by the instructor.

b. V'TECS, Small Engines Repair; Task No. 92

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-04 Cleaning and lubricating the assembly

PERFORMANCE OBJECTIVE

Clean and lubricate the lawnmower assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Using a steam cleaner
b. Mixing of degreaser
c. Cleaning underneath mower
d. Types of grease and oil used
e. Lubricating different points of engine and chassis

Provide Demonstration On:

a. Proper use of steam cleaner
b. Safety while using steam cleaner
c. Mixing solvent with degreaser
d. Greasing and lubricating the component parts

Provide Practical Application On:

a. Use of steam cleaner
b. Mixing of degreaser and solvent
c. Lubricating the engine and chassis components

Related Instruction:

Tasks: RI-01; RI-03; RI-08; RI-10

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (1)(2)

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Steam cleaner
c. Degreaser
d. Chassis grease
e. Lubrication oil

CLASSROOM HOURS 2

EVALUATION (ER-04)

a. Given a lawnmower assembly and necessary tools and equipment, the learner will clean the assembly. After the assembly is clean it will be oiled and greased with the proper type lubricant as specified by the manufacturer.

b. V'TECS, Small Engine Repair; Task No. 94

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-05 Inspecting and replacing drive mechanisms

PERFORMANCE OBJECTIVE

Inspect and replace lawnmower drive mechanisms.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

- a. Types of drives used to propel mower machines
- b. Types of parts that can be replaced
- c. Deciding when parts that need replaced exceed the value of the machine
- d. Riding mower transmissions and drives

Provide Demonstration On:

- a. Replacing the drive wheels and component gears
- b. Evaluating worn out mechanisms that do not warrant cost or repairs
- c. Replacing drive belts

Provide Practical Application On:

- a. Replacement of drive wheels or gears
- b. Adjusting or replacing drive chains
- c. Replacing gear type transmissions
- d. Replacing driven disc type transmission

Related Instruction:

Tasks: RI-01-03: RI-05; RI-10; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

- a. Purvis
- b. Technical Publications (1)(2)

A/Vs:

Prentice-Hall Media, "Heavy Duty Small Engines" (Filmstrip #5)

Student Manuals:

MAVCC, *Lawn and Garden Equipment Repair*

Tools and Equipment:

- a. Hand tools
- b. Basic gear puller
- c. Manufacturer's manual

CLASSROOM HOURS

4

EVALUATION (ER-05)

a. Given a self-propelled or riding lawnmower and necessary tools and equipment, the learner will inspect the drive mechanisms and repair or replace the component that does not function as the manufacturer intended. The learner will determine whether the components that need to be replaced exceed the value of the machine.

b. V'TECS, Small Engine Repair; Task No. 95, 100

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-06 Repairing frame damage

PERFORMANCE OBJECTIVE

Repair frame damage on lawnmower bodies.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of materials used to manufacture frames
b. Welding or brazing steel frames
c. Repairing aluminum frames
d. Safety while welding

Provide Demonstration On:

Repairing an aluminum or steel frame mower deck

Provide Practical Application On:

Welding or brazing a steel mower deck

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11-13

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (1)(2)

Tools and Equipment:

a. Acetylene welding torch
b. Welding rods
c. Brazing rods
d. Hand tools
e. Cracked mower deck

CLASSROOM HOURS 4

EVALUATION (ER-06)

a. Given a damaged lawnmower frame and necessary tools and equipment, the learner will determine what must be done so that the unit will operate in a safe manner. All repairs must conform to manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 98, 99

TASK

ER-07 Installing a short block assembly

PERFORMANCE OBJECTIVE

Install a short block assembly on a lawnmower.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Removing and inspecting parts that will be used on short block
b. Cleaning chassis after removal of old block
c. Making adjustments after installation of new short block

Provide Practical Application On:

a. Removing engine and inspecting parts to be used on new short block
b. Cleaning chassis
c. Making necessary adjustments after installation of short block

Provide Demonstration On:

Adjusting carburetor, governor and drive pulleys

Related Instruction:

Tasks: RI-01-05; RI-09-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Purvis
b. Technical Publications (1)(2)

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Pullers
c. Flywheel holder
d. Feeler gauge
e. Torque wrench
f. Shop manual

CLASSROOM HOURS

8

EVALUATION (ER-07)

a. Given a lawnmower assembly and necessary tools and equipment, the learner will remove the engine and component parts, inspect reuseable parts, install parts on engine and make necessary adjustments. All defective parts must be identified and work must be within manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 90

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-08 Inspecting the tiller assembly

PERFORMANCE OBJECTIVE

Inspect the garden tiller assembly for safe operating condition.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Gear box and axle seals
b. Condition of tiller tines
c. Belts and idler pulleys

Provide Demonstration On:

a. Checking for worn axle seals on worn gear box
b. Checking of idler pulleys and belt drives

Provide Practical Application On:

a. Checking worn axle seals
b. Checking worn gear box
c. Condition of idler pulleys and drive belts
d. Worn out drive tines

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Tiller assembly
c. Shop manual

CLASSROOM HOURS 2

EVALUATION (ER-08)

Given a garden tiller assembly, the learner will check for worn oil seals, bad gear box, frayed or worn drive belts, misaligned or worn idler pulleys and unserviceable drive tines. All defects must be discovered and recommendations for repair must be based on manufacturer's specifications.

TASK

ER-09 Cleaning and lubricating the tiller assembly

PERFORMANCE OBJECTIVE

Clean and lubricate the tiller assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Using the steam cleaner
b. Proper type engine oil
c. Correct oil for gear box
d. Greasing of levers and linkages

Provide Demonstration On:

a. Using steam cleaner
b. Filling gear box
c. Greasing of levers and linkages

Provide Practical Application On:

a. Using steam cleaner
b. Filling gear box
c. Greasing levers and linkages

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11-12

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Grease gun
c. Lubricating oil
d. Tiller assembly

CLASSROOM HOURS

[illegible]

EVALUATION (ER-09)

a. Given a garden tiller assembly, necessary tools and equipment, the learner will clean the unit, grease linkages and levers and check and fill the gear box to manufacturer's specifications.

b. Technical Publications (2)

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-10 Adjusting and replacing tiller wheels

PERFORMANCE OBJECTIVE

Adjust and replace wheels on a tiller.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of wheels used on tiller machines
b. Proper adjustment of wheel height
c. Changing wheel height in pin holes or locating slots

Provide Demonstration On:

a. Types of wheels used on tiller machine
b. Adjusting proper height of wheel locating slots

Provide Practical Application On:

a. Proper height of wheel
b. Changing wheel height by using pin holes or locating slots

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11-12

INSTRUCTIONAL MATERIALS

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Garden tiller

CLASSROOM HOURS 2

EVALUATION (ER-10)

a. Given a garden tiller assembly the learner will inspect and decide proper height location of tiller wheels. The learner will change wheel height by changing the pins, or adjusting slot location so that tiller can operate as intended.

b. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-11 Inspecting and repairing the controls and drive mechanisms

PERFORMANCE OBJECTIVE

Inspect and repair the controls and drive mechanisms on garden tillers.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of idlers used on tiller mechanisms
b. Special v-belts used to power drive units
c. Types of drives such as chain and worm units
d. Clutch cone units (Sears)

Provide Demonstration On:

a. Adjusting belt idlers
b. Proper turning of v-belts
c. Chain drive units
d. Worm drive units
e. Clutch cone units

Provide Practical Application On:

a. Adjusting belt idlers
b. Installing of v-belts
c. Replacing chain on chain drive
d. Replacing pinion or worm or worm drive
e. Replace axle seals on tiller tines shaft
f. Replacing cone type

Related Instruction:

Tasks: ER-01-03; ER-05; ER-10

INSTRUCTIONAL MATERIALS

A/Vs:

Prentice-Hall, "Heavy Duty Small Engines" (Filmstrip #5)

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Special gear lube
c. Different drive styles for tillers

CLASSROOM HOURS 16

EVALUATION (ER-11)

a. Given a garden tiller and necessary tools and equipment, the learner will inspect the unit for worn belts, worn linkages and damaged drive components. The learner will replace belts, adjust idlers, install new chains or worn parts in the drive mechanism so that the unit will operate and function according to manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 91

c. MAVCC, Lawn and Garden Equipment Repair

TASK

ER-12 Repairing frame damage

PERFORMANCE OBJECTIVE

Repair frame damage on a tiller unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Type of metal to be welded
b. Fusion of brazing material
c. Preparing metal to be welded
d. Using appropriate rod

Provide Demonstration On:

a. Preparing metal to be welded
b. Using brazing or AVC welding

Provide Practical Application On:

Using gas or electric welder to repair cracked frame or handle.

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11-13

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Welding equipment (gas or electric)
b. Grinder
c. Hand tools

CLASSROOM HOURS 4

EVALUATION (ER-12)

a. Given a garden tiller with frame damage and necessary tools and equipment, the learner will make necessary repairs using a gas or electric welder. The tiller will be repaired so that it will operate in a safe manner and to manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 98, 99

TASK

ER-13 Installing a short block assembly

PERFORMANCE OBJECTIVE

Install a short block assembly on the garden tiller.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Removing and inspecting parts that will be used on a short block
b. Cleaning or chassis after removal of old block
c. Making adjustments after installation of new block

Provide Demonstration On:

Adjusting carburetor, governor control, idler and drive pulleys

Provide Practical Application On:

a. Removing and inspecting parts that will be used on new short block
b. Removing old short block
c. Cleaning tiller unit
d. Making necessary adjustment after installation of short block

Related Instruction:

Tasks: RI-01-05; RI-09-11

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

Student Manuals:

MAVCC, Lawn and Garden Equipment Repair

Tools and Equipment:

a. Hand tools
b. Pullers
c. Fix-wheel holder
d. Feeler gauge
e. Torque wrench
f. Shop manual

CLASSROOM HOURS 8

EVALUATION (ER-13)

a. Given a tiller assembly and necessary tools and equipment, the learner will remove the engine and component parts, inspect reuseable parts, install parts on engine and make necessary adjustments. All defective parts must be identified and work must be within manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 90

c. Questions in textbook

TASK

ER-14 Handling the chain saw safely

PERFORMANCE OBJECTIVE

Start, run-up, carry and safely use the chain saw.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Correct procedure when pulling starter cord
b. Placement of chain saw on a solid source other than cement when running engine
c. Correct procedure for handling chain saw
d. Lubrication of chain when running out engine
e. Safe cutting procedures
f. Kickback dangers

Provide Demonstration On:

a. Correct procedure when pulling starter cord
b. Mounting of chain saw when making adjustments
c. Lubrication of chain while running engine
d. Carrying saw
e. Cutting with saw

Provide Practical Application On:

a. Correct procedure when pulling starter cord
b. Mounting of chain saw when making running adjustments
c. Lubricating the chain when making running adjustments
d. Cutting with saw

Related Instruction:

Tasks: RI-01; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

a. Purvis
b. Technical Publication (4)

A/Vs:

Homelite, "Do It Right" (16mm Film)

Student Manuals:

a. MAVCC, Chain Saw Repair
b. Chain saw manufacturer's handbook

CLASSROOM HOURS

2

EVALUATION (ER-14)

a. Given a power chain saw, the learner will develop an awareness of dangers when starting and using the saw. The learner will demonstrate to the instructor acceptable safety procedures as outlined by chain saw manufacturers.

b. MAVCC, Chain Saw Repair

TASK

ER-15 Identifying the componet parts of the chain saw

PERFORMANCE OBJECTIVE

Recognize the parts of the chain saw and describe their functions.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-39 through SE-42

Provide Information On:

a. Chain saw engines compared to other 2-cycle engines
b. Chain drive mechanisms (gear and direct type)
c. Sprockets and clutches
d. Bars
e. Safety devices
f. Chain oilers (manual and automatic)
g. Antivibration mountings

Provide Demonstration On:

Identifying different designs and models of chain saws

Provide Practical Application On:

Have learner identify components and describe function of each.

Related Instruction:

Tasks: RI-01-03; RI-07-11

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Student Manuals:

MAVCC, Chain Saw Repair

Tools and Equipment:

a. Chain saw selection
b. Bars, chains, sprockets, etc.

CLASSROOM HOURS 4

EVALUATION (ER-15)

a. Given a chain saw, the learner will identify the engine, sprocket, bar and chain and describe function of each. This must be done with 80% accuracy.

b. MAVCC, Chain Saw Repair

TASK

ER-16 Servicing the chain saw assembly

PERFORMANCE OBJECTIVE

Perform daily maintenance on the chain saw.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Gas/oil ratio
b. Checking chain oil
c. Adjusting chain oiler
d. Chain and bar inspection and adjustment
e. Air filter replacement or cleaning
f. General inspection

Provide Demonstration On:

a. General inspection and chain adjustment
b. Chain oiler adjustment

Provide Practical Application On:

a. Mixing fuel and oil to correct ratio
b. Adjusting and inspecting chain

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-09-11

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Student Manuals:

MAVCC, Chain Saw Repair

Tools and Equipment:

a. Hand tools
b. Chain saw service manual
c. Gas and 2-cycle oil
d. Chain oil

CLASSROOM HOURS 4

EVALUATION (ER-16)

a. Given a chain saw and necessary tools and equipment, the learner will prepare fuel mix, inspect and adjust chain, adjust chain oiler, clean or replace air filter and perform a safety inspection. All work must be within manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 103, 105, 106

c. MAVCC, Chain Saw Repair

TASK

ER-17 Maintain bar, chain and clutch

PERFORMANCE OBJECTIVE

Remove and replace a chain link, face the bar and replace the sprocket assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of sizes of chains
b. Cleaning the chain
c. Chain nomenclature
d. Bar lengths and types (roller nose or plain)
e. Bar wear measurements
f. Sprocket wear
g. Matching sprocket and chain

Provide Demonstration On:

a. Breaking chain and adding links
b. Sharpening chain (electric and hand)
c. Facing the bar
d. Replacing the sprocket and clutch

Provide Practical Application On:

a. Cleaning chain and replacing a link
b. Identifying sizes and shapes of chains
c. Sharpening chain by hand and with electrical bench sharpener
d. Replacing and adjusting sprocket, bar and chain

continued on back

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Student Manuals:

MAVCC, Chain Saw Repair

Tools and Equipment:

a. Chain saw
b. Chain files (assortment)
c. Electric chain sharpener
d. Hand tools
e. Chain saw service manual

CLASSROOM HOURS 8

EVALUATION (ER-17)

a. Given a chain saw and necessary tools and equipment, the learner will replace a cutter link, sharpen the chain, face the bar and replace the sprocket. The chain will be sharpened by hand or by an electric sharpener. Upon completion the saw must cut straight and easily.

b. V'TECS, Small Engine Repair; Task No. 103, 104, 107, 108, 109, 111, 112

c. MAVCC, Chain Saw Repair

TASK

ER-18 Testing, removing and replacing ignition system components

PERFORMANCE OBJECTIVE

Test, remove, replace and adjust magneto and electronic ignition system components.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-10 through SE-15

Provide Information On:

a. Magneto and electronic ignition components
b. Ignition parts location and proper disassembly procedures
c. Component testing procedures

Provide Demonstration On:

a. Correct flywheel removal procedure
b. Component testing
c. Correct reassembly operation
d. Timing the ignition

Provide Practical Application On:

continued on back

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Tools and Equipment:

a. Chain saw with magneto ignition
b. Chain saw with electronic ignition
c. Ignition tester (i.e. Merc-o-Tronic)
d. Hand tools and manufacturer's tools
e. Shop manual

CLASSROOM HOURS

8

EVALUATION (ER-18)

Given a small engine with a malfunctioning ignition system, the learner will remove, test, replace and adjust needed parts to restore engine to manufacturer's specifications.

INSTRUCTIONAL ACTIVITIES

Provide Practical Application On:

a. Disassembling necessary parts to locate ignition system
b. Identifying the component parts
c. Testing and replacing necessary parts
d. Making adjustments to specifications

Related Instruction:

Tasks: RI-01-03; RI-05; RI-08; RI-11

TASK

ER-19 Reconditioning the carburetor and fuel system components

PERFORMANCE OBJECTIVE

Rebuild the diaphragm type combination carburetor and fuel pump and replace the fuel lines and filter.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-01 through SE-09

Provide Information On:

a. Carburetor identification
b. Carburetor removal procedures
c. Proper disassembly and assembly techniques
d. Fuel line pick up tube
e. Crankcase vacuum

Provide Demonstration On:

a. Diaphragm type carburetors in operation
b. Tear down and overhaul procedures

Provide Practical Application On:

a. Removing carburetor from engine
b. Disassembling carburetor
c. Defining the basic parts and their functions
d. Reassembling the carburetor

Related Instruction:

Tasks: RI-01-03; RI-05; RI-09; RI-11; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Tools and Equipment:

a. Chain saw
b. Carburetor kit
c. Assortment of carburetors
d. Hand tools
e. Chain saw service manual

CLASSROOM HOURS 8

EVALUATION (ER-19)

Given a chain saw with a diaphragm type carburetor and necessary tools and equipment, the learner will overhaul the carburetor to manufacturer's specifications. The saw must start easily and run in all throttle positions as outlined by the shop manual.

TASK

ER-20 Repairing the starting system

PERFORMANCE OBJECTIVE

Remove and replace the component parts of the rope rewind starting system.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-16 through SE-19

Provide Information On:

a. Types of starters
b. Starter spring safety
c. Spring replacement
d. Rope replacement
e. Types of starter clutches

Provide Demonstration On:

a. Safe procedure for spring replacement
b. Rope replacement
c. Starter clutch cleaning and reassembly

Provide Practical Application On:

a. Replacing the spring
b. Replacing the rope
c. Cleaning or replacing the starter clutch assembly

Related Instruction:

Tasks: RI-01-03; RI-05; RI-07; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Tools and Equipment:

a. Chain saw
b. Starter rope, spring and starter clutch
c. Hand tools
d. Shop manual

CLASSROOM HOURS 4

EVALUATION (ER-20)

Given a chain saw and necessary tools and equipment, the learner will remove the starter assembly and replace the starter spring and rope to manufacturer's specifications.

TASK

ER-21 Disassembling and inspecting the chain saw power unit

PERFORMANCE OBJECTIVE

Disassemble the power unit and inspect the component parts.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-39 through SE-42

Provide Information On:

a. Compare with other 2-cycle engines
b. Disassembling procedure
c. Inspection procedure
d. Engine design
e. Types of engine bearings
f. Critical wear areas
g. Piston design differences

Provide Demonstration On:

a. Correct disassembling procedure
b. Inspection for critical wear
c. Measuring for critical wear

Provide Practical Application On:

a. Disassembling the power unit
b. Cleaning parts
c. Inspecting and reporting condition and component parts

continued on back

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications
(4)

Tools and Equipment:

a. Chain saw
b. Hand tools
c. Manufacturer's special tools
d. Micrometer set
e. Shop manual

CLASSROOM HOURS 20

EVALUATION (ER-21)

Given a chain saw and necessary tools and equipment, the learner will disassemble the engine, clean and inspect component parts and determine any areas of critical wear. Inspection and measurement must be within 5% of known condition.

INSTRUCTIONAL ACTIVITIES

Related Instruction:

Tasks: RI-01; RI-03; RI-05-11; RI-14-15

TASK

ER-22 Reassembling the chain saw power unit

PERFORMANCE OBJECTIVE

Reassemble and test run the chain saw.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-39 through SE-42

Provide Information On:

a. Reassembly procedures
b. Specifications
c. Fitting component parts together
d. Proper parts alignment
e. Operational differences
f. Importance of changing seals and gaskets

Provide Demonstration On:

a. Specification manuals
b. Using a torque wrench
c. Parts alignment
d. Measuring clearances

Provide Practical Application On:

Assembling the chain saw using necessary replacement parts

Related Instruction:

Tasks: RI-01-03; RI-05-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Tools and Equipment:

a. Chain saw
b. Hand tools
c. Manufacturer's special tools
d. Replacement parts
e. Oil

CLASSROOM HOURS 20

EVALUATION (ER-22)

Given a chain saw with all necessary parts and tools, the learner will assemble the engine according to manufacturer's specifications. The engine must start easily and operate within the standards set by the manufacturer.

TASK

ER-23 Diagnosing chain saw problems

PERFORMANCE OBJECTIVE

Develop a comprehensive troubleshooting plan to cover the entire engine.

INSTRUCTIONAL ACTIVITIES

Prerequisite Tasks:

SE-39 through SE-42

Provide Information On:

a. Diagnosis procedures
b. Problem analysis
c. Troubleshooter's flow charts

Provide Demonstration On:

Comprehensive diagnosis

Provide Practical Application On:

Diagnosing known engine problems using troubleshooting plan

Related Instruction:

Tasks: RI-01; RI-03-05; RI-07 RI-09; RI-14-15

INSTRUCTIONAL MATERIALS

Textbooks:

Technical Publications (4)

Tools and Equipment:

a. Chain saw
b. Hand tools
c. Fuel mix
d. Ignition tester

CLASSROOM HOURS 4

EVALUATION (ER-23)

Given a chain saw with a known problem, the learner will develop a troubleshooting plan and locate the problem and the cause. The plan must conform to accepted industry practices.

TASK

ME-01 Identifying the component parts of outboard motor power heads

PERFORMANCE OBJECTIVE

Identify outboard power head parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Types of power heads
b. Construction differences
c. Lubrication
d. Engine variations

Provide Demonstration On:

a. Factory construction of powerheads
b. Cylinder arrangements
c. Types of lubrication

Provide Practical Application On:

a. Identifying powerhead parts
b. Engine variations
c. Types of lubricants

Related Instruction:

Tasks: RI-01-03; RI-07

INSTRUCTIONAL MATERIALS

Textbooks:

a. Purvis
b. Roth

A/Vs:

a. Georgia Transportation Cluster (Slide set ME 7)
b. Ken Cook Marine Engine Lectures (Filmloop MET-ALTI-A93)
c. Delmar (transparencies)
d. Mercury, "Powerhead Overhaul" (Slide set C-90-65165)

Student Manuals:

a. Georgia Transportation Cluster (ME 7)
b. Ken Cook (Filmloop A93 & Workbook-program 17)
c. MAVCC, Outboard Repair

Tools and Equipment:

a. Johnson Factory Shop Manual
b. Mercury Factory Shop Manual

CLASSROOM HOURS

20

EVALUATION (ME-01)

a. Given an outboard motor power head, the learner will be able to identify and label associated parts and describe cylinder arrangements and types of lubricants used in powerhead assemblies.

b. V'TECS, Small Engine Repair, Task No. 119

c. MAVCC, Outboard Repair

d. Questions in textbook

TASK

ME-02 Testing, removing and replacing magneto ignition system components

PERFORMANCE OBJECTIVE

Troubleshoot and repair the outboard magneto ignition system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Review magneto ignition
b. Common magneto problems
c. Removal of magneto
d. Testing ignition coils
e. Testing condensers
f. Checking breaker points
g. Installing magneto parts

Provide Demonstration On:

a. Electrical safety procedures
b. Proper use of ignition testers
c. Checking ignition coils
d. Checking condensers

Provide Practical Application On:

a. Ignition coil output
b. Condenser leakage
c. Installation of ignition components

Related Instruction:

Tasks: RI-01 - 03; RI-05; RI-07 - 08; RI-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Roth
b. Purvis

A/Vs:

a. Georgia Transportation Cluster (ME-1; ME-4)
b. Ken Cook Marine Lectures Test Equipment (Filmloop MET-ALTI-A13)

Student Manuals:

a. Georgia Transportation Cluster (Slide set ME-1, ME-4, ME-13)
b. Boating Industry Association, 4th ed.
c. OMC Technical Guide

Tools and Equipment:

a. Merc-o-Tronic Tester
b. Johnson Factory Shop Manual
c. Hand tools
d. Ignition components

CLASSROOM HOURS

20

EVALUATION (ME-02)

a. Given an outboard motor magneto ignition system, the learner will check electrical components and determine parts that need to be repaired or replaced as prescribed by engine manufacturer specifications.

b. V'TECS, Small Engine Repair, Task No. 67, 68, 69, 70.

c. Georgia Transportation Cluster (ME-13)

d. Questions in textbook

e. Outboard Marine, Technician Guide

TASK

ME-03 Testing, removing and replacing electronic ignition system components

PERFORMANCE OBJECTIVE

Remove, test and replace outboard electronic ignition system.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Solid state ignition
b. C.D. systems
c. Magneto D.C. systems
d. Testing of solid state systems
e. Timing of electronic ignition
f. Common problems of C.D. system
g. Removing and replacing component parts

Provide Demonstration On:

a. Electrical safety procedures
b. Testing solid state systems
c. Use of special test equipment
d. Timing of solid state systems

Provide Practical Application On:

a. Testing of solid state ignition system
b. Removing and installing component parts
c. Timing of electronic ignition

Related Instruction:

Tasks: RI-01 - 03; RI-05; RI-07-08; RI-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. OMC
b. Roth

Student Manuals:

a. OMC Technician Guide
b. Boating Industry Association 4th ed.

Tools and Equipment:

a. OMC Factory Manual
b. Merc-o-Tronic Ignition Tester
c. VOM meter
d. Neon tester
e. Spark tester
f. Hand tools

CLASSROOM HOURS 30

EVALUATION (ME-03)

a. Given an outboard marine engine, the learner will check output of an electronic ignition system. The learner will determine electronic components that need to be replaced or repaired as prescribed by the proper shop manual procedure.

b. V'TECS, Small Engine Repair, Task No. 74

c. Outboard Marine Training (406412)

TASK

ME-04 Removing the power head from the lower unit

PERFORMANCE OBJECTIVE

Remove outboard motor power head assembly from the lower unit housing.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Effects of salt and corrosion
b. Removal of proper fasteners
c. Use of shop manual
d. Lifting of power head

Provide Demonstration On:

a. Use of applied heat to fasteners
b. Safety procedures
c. Removal of power head

Provide Practical Application On:

b. Removing of power head
b. Safety procedures

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-12

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

Georgia Transportation Cluster (Slide set ME-7)

Student Manuals:

a. Georgia Transportation Cluster (ME-7)
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Handtools
b. Work stand
c. Shop manuals
d. Gas torch

CLASSROOM HOURS	10

EVALUATION (ME-04)

a. Given an outboard motor, the learner will remove the power head according to manufacturer's specifications and without damage.

b. Questions in textbook

c. MAVCC, Outboard Repair

d. V'TECS, Small Engine Repair

TASK

ME-05 Reconditioning the carburetor and fuel system components

PERFORMANCE OBJECTIVE

Recondition the carburetor and fuel system components.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Marine type fuel filters and lines
b. Types of fuel pumps
c. Variation in carburetion
d. Adjustable needle valve
e. Fixed or non-adjustable valves
f. Float level adjustments

Provide Demonstration On:

a. Variation in carburetion
b. Float valve adjustments
c. Fuel pump valves and diaphragms

Provide Practical Application On:

a. Removing carburetor
b. Removing fuel pump
c. Rebuilding carburetor
d. Rebuilding fuel pump

Related Instruction:

Tasks: RI-01 - 03; RI-05 - 06; RI-09; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Purvis
b. Roth
c. Pipe

A/Vs:

a. Ken Cook (Filmloop VIWS-A02)
b. Georgia Transportation Cluster (Slide set ME-5, ME-11, ME-12)

Student Manuals:

a. Ken Cook (Program 17)
b. Georgia Transportation Cluster (ME-5, ME-11, ME-12)
c. MAVCC, Outboard Repair

Tools and Equipment:

a. Factory shop manual
b. Vacuum gauge
c. Hand tools

CLASSROOM HOURS 20

EVALUATION (ME-05)

a. Given an outboard engine fuel system, the learner will clean carburetors or fuel pumps and set up the components according to the factory specification prescribed by the specific shop manual.

b. Questions in textbook

c. MAVCC, Outboard Repair

d. Georgia Transportation Cluster, ME-5, ME-11, ME-12

TASK

ME-06 Disassembling and inspecting the powerhead

PERFORMANCE OBJECTIVE

Disassemble and inspect the outboard engine powerhead.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Separating or splitting cylinder block
b. Measuring crankshaft
c. Measuring cylinders
d. Needle bearings
e. Special O-ring seals

Provide Demonstration On:

a. Splitting of cylinder block
b. Removal of needle bearings
c. Measuring for wear
d. Carbon seals

Provide Practical Application On:

a. Splitting of crankcase
b. Measuring for wear
c. Removing needle bearings

Related Instruction:

Tasks: RI-01; RI-03; RI-05-06; RI-11 - 12; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Roth
b. Purvis

A/Vs:

a. Georgia Transportation Cluster (Slide set ME-7)
b. Ken Cook (Program 17)
c. Mercury, "Powerhead Overhaul" (Slide set C-90-65165)

Student Manuals:

a. Ken Cook Powerhead (Program 17)
b. Georgia Transportation Cluster (ME-7)

Tools and Equipment:

a. Handtools
b. Micrometer
c. Powerhead stand

CLASSROOM HOURS

30

EVALUATION (ME-06)

a. Given an outboard marine powerhead, the learner will disassemble the crankcase and inspect various parts for wear and damage as outlined according to the engine specifications.

b. Questions in textbook

c. Georgia Transportation Cluster ME-7

d. Ken Cook Program 17

TASK

ME-07 Reassembling the power head

PERFORMANCE OBJECTIVE

Reassemble an outboard motor power head assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Pressure differentials
b. Importance of crankcase seal
c. Piston ring design
d. Types of bearings and clearance
e. Piston design and assembly procedure
f. Torquing of component parts

Provide Demonstration On:

a. Installation of piston
b. Use of special ring compressors
c. Fitting of engine bearings
d. Installation of carbon type seals

Provide Practical Application On:

a. Using ring compressors
b. Installing pistons
c. Fitting of bearings
d. Torquing of component parts

Related Instruction:

Tasks: RI-01 - 03; RI-05 - 06; RI-11; RI-14

INSTRUCTIONAL MATERIALS

Textbooks:

a. Roth
b. Purvis

A/Vs:

a. Georgia Transportation Cluster (Slide set ME-9)
b. Mercury, "Powerhead Overhaul" (Slide set C-90-65165)

Student Manuals:

a. Georgia Transportation Cluster (ME-9)
b. Ken Cook Workbook Program 17

Tools and Equipment:

a. Factory service manual
b. Hand tools
c. Ring compressors
d. Lubricants

CLASSROOM HOURS 30

EVALUATION (ME-07)

a. Given a disassembled outboard marine power head and necessary tools and equipment, the learner will reassemble the unit to manufacturer's specifications.

b. Questions in textbook

c. Ken Cook Workbook Program 17

TASK

ME-08 Testing the motor in the tank

PERFORMANCE OBJECTIVE

Test the motor in the tank.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Tank water levels
b. Propeller test wheels
c. Exhaust gas venting
d. Starting and stopping engine

Provide Demonstration On:

a. Safety of engine mounting on tank
b. Fire safety
c. Installing of test wheels
d. Starting and stopping engine

Provide Practical Application On:

a. Selection of test wheels
b. Installing into tank
c. Exhaust venting
d. Starting and stopping engine

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-07

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

Ken Cook (Filmloop MRT-ALTI-A12)

Student Manuals:

a. Ken Cook (Filmloop MET-ALTI-A12)
b. Boating Industry Association Manual 1974

Tools and Equipment:

a. Marine test tank
b. Hand tools
c. Test wheels
d. Fire extinguisher

CLASSROOM HOURS 10

EVALUATION (ME-08)

a. Given an outboard motor, the learner will fit proper test wheel on engine, install engine in tank and make necessary hook ups for engine starting and stopping according to manufacturer's specifications.

b. Boating Industry Association Manual 1974

TASK

ME-09 Making final adjustments

PERFORMANCE OBJECTIVE

Adjust throttle speeds, timing and fuel/air ratio.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Timing of engine
b. Fast idle adjustment
c. High speed adjustments
d. Low speed adjustments
e. Use of tachometer

Provide Demonstration On:

a. Adjusting high speed
b. Adjusting low speed
c. Setting of ignition timing

Provide Practical Application On:

a. Setting ignition timing
b. Setting idle
c. High speed mixture
d. Low speed mixture
e. Using tachometer

Related Instruction:

Tasks: RI-01; RI-03; RI-05 - 06; RI-11; RI-14

INSTRUCTIONAL MATERIALS

A/Vs:

Ken Cook (Filmloop MET-ALTI-A-12)

Student Manuals:

Ken Cook

Tools and Equipment:

a. Factory shop manual
b. Tachometer
c. Hand tools

CLASSROOM HOURS 10

EVALUATION (ME-09)

a. Given an outboard motor, the learner will adjust all throttle positions, timing and fuel/air ratios to within manufacturer's specifications.

b. Ken Cook MET-ALTI-A12

TASK

ME-10 Diagnosing problems in the outboard powerhead

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the powerhead.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Engine compression
b. Damaged reed valves
c. Noises in crankcase
d. Cooling problems

Provide Demonstration On:

a. Proper use of compression tester
b. Engines that have broken reed valves
c. Outboard with loose internal components
d. Effects of overheating

Provide Practical Application On:

a. Testing engine compression
b. Checking for damaged reed valves
c. Listening to engine noise
d. Checking engine temperature

Related Instruction:

Tasks: RI-01; RI-03 - 05; RI-07 - 09; RI-14 - 15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Delmar transparencies
b. Ken Cook (Filmloop MET-ALTI-A13)
c. Georgia Transportation Cluster (Slide set ME-7)

Student Manuals:

a. Georgia Transportation Cluster (ME-7)
b. Ken Cook Workbook (Program 17)

Tools and Equipment:

a. Compression tester
b. Temperature stick
c. Hand tools
d. Shop manuals

CLASSROOM HOURS 20

EVALUATION (ME-10)

a. Given an outboard marine engine, the learner will troubleshoot power head for internal problems and check engine for heating difficulties. Known conditions must be identified with 100% accuracy.

b. MAVCC, Outboard Repair

c. Questions in textbook

TASK

ME-11 Identifying the component parts

PERFORMANCE OBJECTIVE

Identify the component parts of an outboard motor lower unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Component parts of manual shift lower units
b. Parts of electric shift
c. Parts of hydro-electric shift
d. Component parts of power-shift
e. Types of water pumps
f. Proper type of gear lubricants

Provide Demonstration On:

a. Shifting of gear transmission
b. Shifting of electric shift transmission
c. Filling lower unit with proper lubricants
d. Installation of pump impellers

Provide Practical Application On:

a. Identifying component parts of a lower unit
b. Selecting proper lubricants
c. Identifying different types of transmissions

Related Instruction:

Tasks: RI-01 - 03; RI-07

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Georgia Transportation (Slide ME-8)
b. Ken Cook Marine Engines (Filmloop MET-ALTI-A93)
c. Delmar transparencies
d. Mercury "Gear Housing Disassembly" (Slide set C-90-63204-1)

Student Manuals:

a. Georgia Transportation Cluster ME-8
b. Ken Cook Workbook
c. MAVCC, Outboard Repair

Tools and Equipment:

a. Johnson Factory Service and Parts Manuals
b. Mercury Factory Service and Parts Manuals

CLASSROOM HOURS

30

EVALUATION (ME-11)

a. Given an outboard motor lower unit, the learner will be able to identify the various parts and describe function with 80% accuracy.

b. Questions in textbook

c. MAVCC, Outboard Repair

d. V'TECS, Small Engine Repair, Task No. 115, 126

TASK

ME-12 Replacing propellers

PERFORMANCE OBJECTIVE

Replace outboard marine propellers.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Type of materials used in construction
b. Left and right hand propellers
c. Propeller pitch
d. Cupped propellers
e. Shear pin and clutch hubs
f. Corrosion of shaft and prop

Provide Demonstration On:

a. Proper use of propeller puller
b. Differences of left and right hand props
c. Use of cupped propellers
d. Proper installation procedures

Provide Practical Application On:

a. Pulling of propellers
b. Selecting proper pitch
c. Installing propellers

Related Instructions:

Tasks: RI-01 - 03; RI-05; RI-11 - 12; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Ken Cook
b. Delmar transparencies

Student Manuals:

a. Ken Cook
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Hand tools
b. Prop pullers
c. Shop manual

CLASSROOM HOURS 15

EVALUATION (ME-12)

a. Given an outboard lower unit, the learner will replace the propeller using special tools and equipment as needed. The learner will select the proper propeller to be used as required for that particular need with 100% accuracy.

b. V'TECS, Small Engine Repair

c. MAVCC, Outboard Repair

TASK

ME-13 Inspecting and replacing the water pump and component parts

PERFORMANCE OBJECTIVE

Inspect and replace the water pump and component parts.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Removing water pump housing
b. Removing water pump impeller
c. Inspecting of pump housing
d. Checking pump impeller
e. Water tubes and grommets
f. Inspecting water pump seals
g. Drive shaft condition

Provide Demonstration On:

a. Installing water pump impeller
b. Installing water pump grommets

Provide Practical Application On:

a. Removal of pump housing
b. Removal of impeller
c. Installing pump impeller
d. Installing housing
e. Lubricating drive shaft

Related Instruction:

Tasks: RI-01 - 03; RI-05 - 06; RI-11 - 12; RI-14 - 15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Georgia Transportation Cluster (Slide set ME-10)
b. Mercury, "Gear Housing Reassembly" (Slide set C-90-63204-2)

Student Manuals:

a. Georgia Transportation Cluster (ME-10)
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Shop manuals
b. Hand tools

CLASSROOM HOURS 15

EVALUATION (ER-13)

a. Given a tiller assembly and necessary tools and equipment, the learner will remove the engine and component parts, inspect reuseable parts, install parts on engine and make necessary adjustments. All defective parts must be identified and work must be within manufacturer's specifications.

b. V'TECS, Small Engine Repair; Task No. 90

c. Questions in textbook

TASK

ME-14 Disassembling and inspecting gear drive assembly

PERFORMANCE OBJECTIVE

Disassemble and inspect the gear drive in the lower unit assembly.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Lower unit holding fixtures
b. Use of special tools used to remove gearcase assembly
c. Inspecting pinion gear, forward gear and reverse gear
d. Propeller shaft and clutch dog
e. Checking bearing wear
f. Inspecting oil seals

Provide Demonstration On:

a. Using special tools on gearcase
b. Disassembly procedures

Provide Practical Application On:

a. Using holding fixtures
b. Disassembling and inspecting lower unit gears
c. Using special tools
d. Checking for bearing wear
e. Inspecting prop shaft and oil seals

Related Instruction:

Tasks: RI-01; RI-03; RI-05 - 06; RI-10 - 11; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Georgia Transportation Cluster (Slide ME-8)
b. Mercury, "Gear Housing Disassembly" (Slide set C-90-63204-1)

Student Manuals:

a. Georgia Transportation Cluster (ME-8)
b. Ken Cook Workbook
c. MAVCC, Outboard Repair

Tools and Equipment:

a. Shop manuals
b. Hand tools
c. Special lower unit tools

CLASSROOM HOURS 20

EVALUATION (ME-14)

a. Given a lower unit gear drive assembly and necessary tools and equipment, the learner will disassemble and inspect the gears and bearings for wear or damage. All defective parts will be identified.

b. MAVCC, Outboard Repair

c. Questions in textbook

d. V'TECS, Small Engine Repair, Task No. 114

TASK

ME-15 Reassembling the gear drive

PERFORMANCE OBJECTIVE

Reassemble the outboard lower unit gear drive.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Bearing drivers
b. Lower unit holding fixtures
c. Shimming for gear clearances
d. Installation of oil seals
e. Filling lower unit with lubricant

Provide Information On:

a. Using lower unit holding fixture
b. Shimming for correct gear clearance
c. Installing of oil seals

Provide Practical Application On:

a. Use of unit holding fixture
b. Shimming for gear clearances
c. Installing of oil seals
d. Filling unit with oil

Related Instruction:

Tasks: RI-01 - 03; RI-05 - 06; RI-11; RI-14 - 15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

a. Georgia Transportation Cluster (Slide set ME-10)
b. Mercury, "Gear Housing Reassembly" (Slide set C-90-53204-2)

Student Manuals:

a. Georgia Transportation Cluster
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Lower unit holding fixture
b. Shimming tools
c. Bearing drivers
d. Hand tools
e. Factory shop manuals

CLASSROOM HOURS

15

EVALUATION (ME-15)

a. Given an outboard lower unit gear drive and necessary tools and equipment, the learner will assemble the lower unit components so that the unit will perform in a like-new manner and according to manufacturer's specifications.

b. Questions in textbook

c. MAVCC, Outboard Repair

d. V'TECS, Small Engine Repair, Tasks No. 117, 118

TASK

ME-16 Mounting the lower unit to the powerhead

PERFORMANCE OBJECTIVE

Install the lower unit assembly to the outboard power head.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Greasing driveshaft splines
b. Shift linkage adjustments
c. Cleaning powerhead mounting surface
d. Proper tightening of bolts
e. Wiring harness

Provide Demonstration On:

a. Adjusting shift linkage
b. Proper hook up of wire harness
c. Alignment procedures

Provide Practical Application On:

a. Installing powerhead on lower unit
b. Adjusting linkage
c. Installing wire harness

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

Georgia Transportation Cluster (Filmslide ME-9)

Student Manuals:

Georgia Transportation Cluster (Filmslide ME-9)

Tools and Equipment:

a. Hand tools
b. Gasket scraper
c. Grease
d. Shop manuals

CLASSROOM HOURS 10

EVALUATION (ME-16)

a. Given an outboard engine power head, the learner will install it on the lower unit and make necessary linkage adjustments as outlined in the manufacturer's manual. Unit must shift properly upon completion.

b. V'TECS, Small Engine Repair, Task No. 119

c. Questions in textbook

TASK

ME-17 Mounting the motor on the boat

PERFORMANCE OBJECTIVE

Install outboard motor on the boat.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Lifting of outboard motor
b. Types of mounting brackets
c. Sealing of mount bolts
d. Proper height of engine
e. Proper angle of engine
f. Installing control cables

Provide Demonstration On:

a. Safety angles
b. Angle of engine
c. Transom height

Provide Practical Application On:

a. Lifting outboard motor
b. Sealing of mounting bolts
c. Adjusting angle of engine
d. Adjusting engine height
e. Installing remote control cables

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11; RI-14 - 15

INSTRUCTIONAL MATERIALS

Student Manuals:

Boating Industry Association

Tools and Equipment:

a. Hand tools
b. Sealant
c. Lifting hoist
d. Shop manual

CLASSROOM HOURS

20

EVALUATION (ME-17)

a. Given an outboard marine engine, the learner will mount the unit on the transom of a boat. The learner will secure engine to boat, adjust for proper running angle and running height. This will be done in a safe manner and to manufacturer's specifications.

b. Boating Industry Association

TASK

ME-18 Making control adjustments

PERFORMANCE OBJECTIVE

Adjust remote control linkage.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Adjustment of fast idle stop
b. Adjustment of throttle friction
c. Adjustment of wide open throttle
d. Checking start position
e. Checking warm up level

Provide Demonstration On:

a. Adjusting friction for throttle
b. Adjusting fast idle stop

Provide Practical Application On:

a. Setting fast idle stop
b. Setting throttle friction
c. Checking warm up level
d. Checking wide open throttle

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11

INSTRUCTIONAL MATERIALS

Student Manuals:

a. Boating Industry Association
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Hand tools
b. Shop manuals

CLASSROOM HOURS 5

EVALUATION (ME-18)

a. Given a set of remote controls, the learner will make adjustments that relate to engine warm up, fast idle stops, throttle friction and wide open adjustments as prescribed by the manufacturer. Upon completion, the remote control must work without binding and within specifications.

b. MAVCC, Outboard Repair

c. Boating Industry Association

TASK

ME-19 Diagnosing problems in the lower unit

PERFORMANCE OBJECTIVE

Develop a troubleshooting plan for locating problems in the outboard lower unit.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Water entering gearcase
b. Stripped drive shaft splines
c. Bearing noises
d. Clutch dog misadjustment
e. Incorrect gear lash

Provide Demonstration On:

a. Adjust clutch dog engagement
b. Check for proper gear lash
c. Checking unit for water and water damage

Provide Practical Application On:

a. Checking for water in case
b. Checking gear lash
c. Adjusting clutch dog engagement
d. Listening to unit that has defective bearings or stripped splines

Related Instruction:

Tasks: RI-01; RI-03 - 05; RI-07 - 08; RI-10; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

Purvis

A/Vs:

Georgia Transportation Cluster (Slide set ME-6)

Student Manuals:

a. Boating Industry Association
b. Georgia Transportation Cluster (ME-6)

Tools and Equipment:

a. Hand tools
b. Test tools
c. Shop manuals

CLASSROOM HOURS 15

EVALUATION (ME-19)

a. Given an outboard lower unit that has gearcase problems, the learner will develop a troubleshooting plan and locate the problem in double the flat rate time.

b. Questions in textbooks

TASK

ME-20 Winterizing and storing the outboard motor

PERFORMANCE OBJECTIVE

Winterize and store the outboard motor.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Special anti-rust lubricants
b. Reasons for draining lower unit oil
c. Defogging engine
d. Lubricating cylinders

Provide Demonstration On:

Defogging of outboard engine in test tank

Provide Practical Application On:

a. Defogging engine
b. Draining gearcase oil
c. Lubricating cylinders

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-09 - 10.

INSTRUCTIONAL MATERIALS

Textbooks:

a. Purvis
b. Boating Industry Association

A/Vs:

Georgia Transportation Cluster (Slide set ME-16)

Student Manuals:

Georgia Transportation Cluster (ME-16)

Tools and Equipment:

a. Fogging oil
b. Lower unit oil
c. Hand tools
d. Shop manual

CLASSROOM HOURS

10

EVALUATION (ME-20)

a. Given an outboard marine engine, the learner will winterize the unit so that the internal parts will not rust or external components freeze and crack.

b. Questions in textbook

TASK

ME-21 Installing motor controls

PERFORMANCE OBJECTIVE

Install outboard motor controls on bcats.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Determining proper mounting location
b. Selecting tools necessary for cutting holes
c. Securing and routing wires or cables

Provide Demonstration On:

a. Safety procedures
b. Cutting holes for control mounting
c. Routing wires and cables

Provide Practical Application On:

a. Mounting of motor controls
b. Cutting holes in fiberglass and aluminum
c. Routing and securing cable and wires

Related Instruction:

Tasks: RI-01-05; RI-11

INSTRUCTIONAL MATERIALS

Textbooks:

a. Boating Industry Association (BIA)
b. MAVCC, Outboard Repair

Tools and Equipment:

a. Hand tools
b. Drill
c. Hole saw
d. Hanger and wire ties
e. Shop manual

CLASSROOM HOURS 10

EVALUATION (ME-21)

a. Given an outboard motor boat, the learner will decide the best possible place for mounting outboard motor controls. Using the proper tools, the learner will mount the controls and secure the cable and wire in a safe manner and in accordance with boating industry standards.

b. MAVCC, Outboard Repair

TASK

ME-22 Installing steering mechanisms

PERFORMANCE OBJECTIVE

Install cable and mechanical type steering systems.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Cable type steering
b. Mechanical type steering
c. Hydraulic type steering systems

Provide Demonstration On:

a. Winding cable on steering drum
b. Location of pulleys
c. Attaching tillers
d. Measuring cable for mechanical steering
e. Measuring for anchoring mechanical steering tube

Provide Practical Application On:

a. Measuring for cable type steering
b. Winding cable on steering drum
c. Adjusting tension of cables
d. Rigging of mechanical steering
e. Centering of tiller attaching tube

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11-12

INSTRUCTIONAL MATERIALS

Textbooks:

BIA

Tools and Equipment:

a. Hand tools
b. Electric drill
c. Hole saw
d. Factory manual

CLASSROOM HOURS 20

EVALUATION (ME-22)

Given an outboard motor boat and necessary tools and equipment, the learner will measure for correct steering cable length, use the proper tiller attachments and install the steering components as outlined by the manufacturer and according to specifications as recommended by the Boating Industry Association.

TASK

ME-23 Installing marine accessories

PERFORMANCE OBJECTIVE

Install speedometers, compasses, depth finders, engine warning lights and gauges, running lights and switches.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Importance of proper location of the accessory
b. Using the correct type of fastening device
c. Special marine electrical switches
d. Use of correct fuse
e. Importance of correct gauge wire (hot and grounded) for that particular accessory
f. Proper routing of necessary wires
g. Salt and freshwater hardware

Provide Demonstration On:

a. Selecting proper mounting area for accessory
b. Using correct type of fastenening device and hardware
c. Wiring types of marine switches

Provide Practical Application On:

a. Location of mounting area
b. Using the correct fastener
c. Wiring accessory switch
d. Wiring accessory fuse
e. Securing and routing wire around hull

continued on back

INSTRUCTIONAL MATERIALS

Textbooks:

BIA

Tools and Equipment:

a. Hand tools
b. Drill
c. Fasteners
d. Wire and wire ends
e. Manufacturer's manuals

CLASSROOM HOURS 10

EVALUATION (ME-23)

Given a marine boating accessory and necessary tools and equipment, the learner will select a suitable mounting area and install the accessory. The accessory must operate and function as outlined by the factory installation manual.

INSTRUCTIONAL ACTIVITIES

Related Instruction:

Tasks: RI-01-03; RI-05; RI-11-12

TASK

ME-24 Making fiberglass repairs

PERFORMANCE OBJECTIVE

Repair a damaged fiberglass hull.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Polyester and epoxy resins
b. Polyester pigments
c. Fiberglass mat
d. Fiberglass cloth
e. Woven roving
f. Putties and compounds
g. Hardeners
h. Acetone
i. Preparation of damaged area

Provide Demonstration On:

a. Safety when using fiberglassing compounds
b. Mixing correct amount of hardener with resin
c. Selecting proper cloth

Provide Practical Application On:

a. Selecting type of fiberglass
b. Mixing color agent
c. Mixing of catalysts
d. Applying cloth and resin
e. Cleaning applicators

Related Instruction:

Tasks: RI-01; RI-03; RI-05

INSTRUCTIONAL MATERIALS

Textbooks:

BIA

Tools and Equipment:

a. Hand tools
b. Paint brushes
c. Containers
d. Fiberglassing materials

CLASSROOM HOURS 10

EVALUATION (ME-24)

Given a damaged fiberglass boat and necessary tools and equipment, the learner will prepare the damaged area, mix the catalyst so that the resin will harden at the correct rate and select the type of cloth for the repair. This must be done according to suggested BIA specifications.

TASK

ME-25 Placing boat on the trailer

PERFORMANCE OBJECTIVE

Place boat on the trailer.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Using tilt type trailer
b. Adjustment of rollers on keel
c. Adjusting side pads
d. Adjusting tongue weight
e. Checking winch
f. Types of tie down straps

Provide Demonstration On:

a. Correct roller to keel friction
b. Adjusting tongue weight
c. Safety when using winch

Provide Practical Application On:

a. Using tilt trailer to lift boat on trailer
b. Adjusting rollers and side pads
c. Adjusting for proper tongue weight
d. Using tie down straps

Related Instruction:

Tasks: RI-01; RI-03; RI-15

INSTRUCTIONAL MATERIALS

Textbooks:

BIA

Tools and Equipment:

a. Hand tools
b. Weight scale
c. Manufacturer's manual

CLASSROOM HOURS

5

EVALUATION (ME-25)

Given a boat trailer, the learner will winch the boat on the trailer using the tilt or break-a-way design as an aid. The learner will adjust rollers and side pads to fit boat and adjust tongue weight to manufacturer's specifications.

TASK

ME-26 Repairing trailer lighting

PERFORMANCE OBJECTIVE

Repair boat trailer lighting.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Water damage in bulb sockets
b. Broken wires around trailer break-a-way
c. Loose and corroded gounds - color codes
d. Damaged male and female connectors
e. Using test battery and volt meter

Provide Demonstration On:

Using test battery and volt meter in checking light circuits

Provide Practical Application On:

a. Checking bulb sockets
b. Checking plug connectors
c. Repairing faulty grounds
d. Using test battery and volt meter

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-08; RI-11; RI-13

INSTRUCTIONAL MATERIALS

Textbooks:

BIA

Tools and Equipment:

a. Hand tools
b. Volt meter
c. Battery

CLASSROOM HOURS 5

EVALUATION (ME-26)

Given a boat trailer and necessary tools and equipment, the learner will locate all loose grounds, broken wires, corroded bulbs and faulty connectors and make the necessary repairs so that all trailer lights operate as intended by the manufacturer.

TASK

ME-27 Repairing the trailer frame

PERFORMANCE OBJECTIVE

Repair the boat trailer frame.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Spring shackles
b. Leaf springs
c. Heating metal
d. Bending metal
e. Cutting and welding

Provide Demonstration On:

a. Heating metal
b. Bending metal
c. Cutting and welding

Provide Practical Application On:

a. Replace bent spring shackles
b. Changing leaf springs
c. Heating metal
d. Bending metal
e. Cutting and welding trailer frame components

Related Instruction:

Tasks: RI-01; RI-03; RI-05; RI-11-13

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Hand tools
b. Acetylene torch
c. Bending fixture
d. Welding rods

CLASSROOM HOURS 10

EVALUATION (ME-27)

Given a boat trailer and necessary tools and equipment, the learner will cut out damaged area and replace with a new piece of metal. The learner may heat and straighten damaged area or replace bent part of the trailer. The learner will replace springs and shackles according to manufacturer's specifications.

TASK

ME-28 Replacing wheel bearings

PERFORMANCE OBJECTIVE

Remove, inspect, repack and replace boat trailer wheel bearings.

INSTRUCTIONAL ACTIVITIES

Provide Information On:

a. Problems of water damage to bearings
b. Removing bearings and race from axle shaft
c. Installation of bearing race
d. Packing wheel bearings and setting of bearing preload
e. Installing grease seals
f. Tightening of wheel lugs
g. Special precautions for salt water applications
h. Special grease caps (bearing buddy)

Provide Demonstration On:

a. Remove bearings and race from axle and hubs
b. Packing wheel bearings with grease
c. Setting bearing preload

Provide Practical Application On:

a. Removing bearings and race from axle shaft
b. Packing wheel bearings
c. Setting bearing preload
d. Installing grease seals in housing

continued on back

INSTRUCTIONAL MATERIALS

Tools and Equipment:

a. Hand tools
b. Special trailer bearing grease
c. Manufacturer's manual

CLASSROOM HOURS 5

EVALUATION (ME-28)

Given a boat trailer and necessary tools and equipment, the learner will remove the bearing and race using the appropriate tools. The learner will inspect axle shaft for damage, pack new bearings with special trailer grease, install new hub seals and adjust preload. All work must be within trailer manufacturer's specifications.

INSTRUCTIONAL ACTIVITIES

Related Instruction:

Tasks: RI-01-03; RI-05; RI-10-11

SECTION VI

REFERENCES, RESOURCES

INSTRUCTIONAL RESOURCE MATRIX

Introduction

The following Instructional Resource Matrix lists the instructional resources required to carry out the learning activities in each unit in the program. The resources are divided into the following categories: audio visuals, textbooks and student manuals.

Audio visuals and audio visual producers are identifed by the following symbols: filmstrip (FS), slide/script (SS), slide/tape (ST), movie film (MF), transparencies (TR) and filmloops (FL). Producers are identified as follows: American Association for Vocational Instructional Materials (AAVIM), Automated Training, Inc. (ATI), Bergwall (BW), Boating Industry Association (BIA), Briggs and Stratton (B & S), Georgia Department of Education (GA), Lauson Power Products (LA), Mid-America Vocational Curriculum Consortium (MAVCC), Mercury Outboards (Merc), Oklahoma Materials Center (OK) and Prentice-Hall (PH). Audio visuals available from the State of Georgia are either post secondary or secondary. Both are included in the matrix and can be used interchangeably with each unit guide. Post secondary audio visuals and materials are designated by numbers (i.e., 231-1) and secondary materials are identified by letter prefixes and numbers (i.e., HB-1).

Textbooks are identified by author. The complete reference can be found in the Textbook List at the end of this section and addresses are included in the Additional Resources section. Authors with more than one publication are identified by number.

Student manuals produced by Georgia are identified by unit number and title. Other materials are identified by publisher.

CURRICULUM AREA: Small Engine Mechanics
Major Block: Related Instruction

TASK LISTING		INSTRUCTIONAL MATERIAL REFERENCES		
		Audio-Visuals	Textbooks	Student Materials
RI-01	Demonstrating and utilizing school and lab policies and procedures	AAVIM, Developing Shop Safety Skills (ST) GA, 101-1, 2, 3, 4	AAVIM Ohio State	GA 101-1 Intro to indiv. instr. 101-2 Operating cassette player 101-3 Operating filmstrip projector 101-4 Operating filmloop projector Local School Policies AAVIM, Developing Shop Safety Skills
RI-02	Maintaining a parts inventory	B & S, Microfiche (ST)	GMC (ED 022 971)	
RI-03	Reading and interpreting the shop service manuals			
RI-04	Completing job work order forms			
RI-05	Identifying and maintaining shop tools and equipment	BW, Automotive Hand Tools Explained (FS) PH, Auto Mechanics Tools and Basic Skills (FS)	Crouse & Anglin (5)	MAVCC, Automotive or small engine repair programs
RI-06	Using precision measurement tools and equipment	Georgia Metals Cluster, M-1 (ST) PH, Machine Shop Bench Operations (FS)	Stovett	Georgia Metals Cluster, M-1

Major Block: Related Instruction (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
RI-07 Demonstrating engine theories of operation	BW, The Internal Combustion Engine Explained (FS); The Four Cycle Engine Explained (FS) PH, The Basic Engine (FS)	AAVIM, Vol. 1, 2 B & S Brady Glenn Mitchell Pipe Stephenson Stockel (1)	
RI-08 Demonstrating a knowledge of electricity fundamentals	AAVIM, Understanding Electricity and Electrical Terms (ST), (TR) PH, Basic Automotive Service (FS); Auto Mechanics Tools and Basic Skills (FS) BS, Custom VOA Meter (ST); Glossary of Electrical Terms (SS); Electricity and Basic Electrical Terms (ST)	AAVIM	
RI-09 Demonstrating a knowledge of fuels	Shell Film Library AAVIM, Selecting Fuels and Lubricants (ST), (TR)	AAVIM Crouse (1) Stockel (1)	

Major Block: Related Instruction (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
RI-10 Demonstrating a knowledge of lubricants		AAVIM, Vol. 1, 2 Crouse (1) Stockel (1)	
RI-11 Demonstrating a knowledge of hardware and fasteners	PH, Auto Mechanics Tools and Basic Skills		
RI-12 Demonstrating basic metal operations	GA, HT-3, 4 (ST) PH, Machine Shop Bench Operations (FS)		GA HT-3 Making a thread block gauge HT-4 Removing broken stud and installing Helicoil HT-5 Cutting and double flaring copper tubing
RI-13 Demonstrating welding and soldering techniques	Georgia Metals Cluster, BW-5; GC-1-5; GW-1-9 (ST) Scott, Electric Welding (FL) Delmar, Basic Oxyacetylene Welding (FL)	Althouse	Georgia Metals Cluster BW-5 Brace welding lap joints GC-1-5 Gas cutting GW-1-9 Gas welding
RI-14 Demonstrating a knowledge of applied mathematics	PH, Metrics for Auto Mechanics (FS)	GA, Vocational Mathematics Olivio Wilton & Rogers	GA, Transportation Mathematics SM.7.35

Major Block: Related Instruction (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
RI-15 Demonstrating a knowledge of applied science		Crouse (1) Jensen Pipe	AAVIM, Ball and roller bearings

CURRICULUM AREA: Small Engine Mechanics
Major Block: Small Engine Service

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-01 Servicing the fuel tank, lines and filter	AAVIM, Vol. 1, 2 (ST)	Pipe Roth Stephenson Turner, v.1	AAVIM, Workbook Vol. 1, 2 MAVCC, Student Manual
SE-02 Servicing the air cleaner	AAVIM, Vol. 1 (ST) PH, Small Engine Service and Overhaul (FS)	Pipe Roth Turner, v.1	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-03 Adjusting fuel/air mixtures and mechanical linkage	AAVIM, Vol. 1 (ST) B & S, Checking Carburetor Systems (SS) BW, Small Engines Explained (ST)	Pipe Roth Stephenson Turner, v.1	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-04 Reconditioning the float-type carburetor	AAVIM, Vol. 1 (ST) PH, Small Engine Service and Overhaul (FS) LA, Carburetion and Theory (ST)	Pipe Purvis Roth Turner, v.1	AAVIM, Workbook Vol. 2 GA SE-7 Removing and rebuilding a flow jet carburetor MAVCC, Student Manual
SE-05 Reconditioning the suction-lift-type carburetor	AAVIM, Vol. 2 (ST) PH, Small Engine Service and Overhaul (FS)	Pipe Turner, v.1, 2	AAVIM, Workbook Vol. 2 GA SE-8 Removing and rebuilding a vacuum jet carburetor MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-06 Reconditioning the diaphragm-type carburetor	AAVIM, Vol. 2 PH, Small Engine Service and Overhaul (ST) B & S, Pulsa Jet Carburetor (ST) LA, Carburetion Theory (ST)	Pipe Roth Stephenson Turner, v.1, 2	
SE-07 Reconditioning fuel pumps	AAVIM, Vol. 2 (ST)	Pipe Stephenson Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-08 Repairing and adjusting governors	AAVIM, Vol. 2 (ST) BW, Small Engines Explained (FS) B & S, Governors (ST)	Pipe Roth Stephenson Turner, v.1	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-09 Diagnosing fuel system problems	AAVIM, Vol. 1, 2 (ST) B & S, Automatic Choke (ST); Checking Carburetor Systems (SS) LA, Carburetion Theory (ST)	Pipe Purvis Roth Stephenson Turner, v.1	MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING		INSTRUCTIONAL MATERIAL REFERENCES		
		Audio-Visuals	Textbooks	Student Materials
SE-10	Inspecting, selecting and installing spark plugs	AAVIM, Vol. 1 (ST) PH, Small Engine Service and Overhaul (FS) B & S, Spark Plug Blast Cleaning (SS)	Pipe Roth Stephenson Turner, v.1	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-11	Timing the ignition system	AAVIM, Vol. 2 (ST) LA, Ignition Theory (ST)	Pipe Stephenson Turner, v.2	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-12	Testing, removing and replacing magneto ignition components	PH, Small Engine Service and Overhaul (FS) AAVIM, Vol. 2 (ST) B & S, New Ignition System (SS) LA, Ignition Theory (ST) BW, Small Engines Explained (FS)	Pipe Roth Stephenson Turner, v.2	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-13	Testing, removing and replacing battery ignition components	AAVIM, Vol. 2 (ST) LA, Ignition Theory (ST)	Pipe Roth Turner, v.1	AAVIM, Workbook Vol. 2 MAVCC, Student Manual Vol. 2

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-14 Testing, removing and replacing electronic ignition components	LA, Ignition Theory (ST) AAVIM, Vol. 2 (ST)	Pipe Roth Stephenson Turner, v.1	AAVIM, Workbook Vol. 2
SE-15 Diagnosing ignition system problems	AAVIM, Vol. 2 (ST) B & S, Checking Ignition Systems (SS); Troubleshooting (ST)	Pipe Purvis Roth Stephenson Turner, v.2	MAVCC, Student Manual
SE-16 Inspecting and repairing the rope-type starting system	AAVIM, Vol. 2 (ST) B & S, Disassemble-Inspect-Reassemble (SS) LA, Engine (SS)	Pipe Turner, v.1	AAVIM, Workbook Vol. 2 GA SE-10 Removing and repairing a recoil starter MAVCC, Student Manual
SE-17 Inspecting and repairing the wind-up starting system	AAVIM, Vol. 2 (ST) B & S, Disassemble-Inspect-Reassemble (SS) LA, Engine (SS)	Pipe Turner, v.1	AAVIM, Workbook Vol. 2 GA SE-11 Removing and repairing a wind-up starter SE-12 Removing and repairing vertical pull starter MAVCC, Student Manual
SE-18 Inspecting and repairing electric-type starting	AAVIM, Vol. 2 (ST) B & S, Gear Drive Starter Motors (SS)	Pipe Turner, v.1	AAVIM, Workbook Vol. 2 GA SE-13 Removing and repairing 12-volt starter generator MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-19 Diagnosing starting system problems	AAVIM, Vol. 2 (ST) B & S, Nickel Cadmium (SS)	Pipe Turner, v.1	MAVCC, Student Manual
SE-20 Testing and servicing storage batteries and battery packs	AAVIM, Vol. 1 (ST) B & S, 12-volt Batteries (SS) GA, TSB-1, 2a, 2b, 3-5 (ST)	Pipe Purvis Roth Turner, v.1	AAVIM, Workbook GA TSB-1 Testing battery gravity TSB-2 Performing light load test TSB-3 Testing battery capacity TSB-4 Cleaning the battery TSB-5 Charging the battery MAVCC, Student Manual
SE-21 Testing and repairing DC generators and components	AAVIM, Vol. 2 (ST)	Pipe Purvis Turner, v.2	AAVIM, Workbook GA SE-13 Removing and repairing 12-volt starter generator MAVCC, Student Manual
SE-22 Testing and repairing AC generators and components	AAVIM, Vol. 2 (ST) B & S, Alternator Theory (ST); Alternator Systems Update (ST) LA, Alternators (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING		INSTRUCTIONAL MATERIAL REFERENCES		
		Audio-Visuals	Textbooks	Student Materials
SE-23	Testing and repairing the combination generator/starter and components	AAVIM, Vol. 2 (ST) B & S, 12-volt Starter Generator (SS)	Pipe Turner, v.1	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-24	Diagnosing charging system problems	AAVIM, Vol. 2 (ST) B & S, Alternator Troubleshooting (ST) LA, Alternator (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-25	Removing and replacing mufflers and exhaust pipes	AAVIM, Vol. 1 (ST) B & S, Noise Control (ST)	Pipe Purvis Turner, v.1	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-26	Cleaning 2-cycle exhaust system	AAVIM, Vol. 1 (ST) LA, Engine (SS)	Pipe Turner, v.1	AAVIM, Workbook Vol. 1 MAVCC, Student Manual
SE-27	Maintaining emission control devices		Crouse & Anglin (2) Purvis Turner, v.1	MAVCC, Student Manual
SE-28	Diagnosing exhaust and emission control systems	AAVIM, Vol. 1 (ST)	Crouse & Anglin (2) Purvis Turner, v.1	MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-29 Checking valve operation	AAVIM, Vol. 2 (ST) B & S, Valve and Seat Reconditioning (SS) BW, Small Engines Explained (FS)	Pipe Roth Stephenson Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-30 Grinding valves and valve seats	AAVIM, Vol. 2 (ST) B & S, Valve and Seat Reconditioning (SS) PH, Small Engine Service and Overhaul (FS) BW, Small Engines Explained (FS)	Pipe Roth Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-31 Inspecting and repairing the cylinder head	AAVIM, Vol. 2 (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-32 Adjusting valve clearances	AAVIM, Vol. 2 (ST) B & S, Valve and Seat Reconditioning (SS)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-33 Repairing 2-cycle engine valves	AAVIM, Vol. 2 (ST) LA, Engine (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-34 Diagnosing valve problems	AAVIM, Vol. 2 (ST) B & S, Troubleshooting #2 (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-35 Inspecting and measuring wear condition	AAVIM, Vol. 2 (ST) PH, Small Engine Service and Overhaul (FS) B & S, Disassemble-Inspect-Reassemble (SS) LA, Engine (ST)	Pipe Roth Stephenson Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-36 Disassembling and inspecting component parts	AAVIM, Vol. 2 (ST) B & S, Disassemble-Inspect-Reassemble (SS) LA, Engine (ST) PH, Small Engine Service and Overhaul (FS) BW, Small Engines Explained (FS)	Pipe Roth Turner, v.2	AAVIM, Workbook Vol. 2 GA SE-3 Disassembling a small engine MAVCC, Student Manual
SE-37 Reassembling and replacing component parts	(Use reassembly sections of SE-36 audio-visuals)	Pipe Turner, v.2	AAVIM, Workbook Vol. GA SE-4 Reassembling a small engine MAVCC, Student Manual

Major Block: Small Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
SE-38 Diagnosing 4-cycle engine problems	AAVIM, Vol. 2 (ST) B & S, Engine Analysis (SS); Troubleshooting 8000 and 92000 Series Engine (SS); Troubleshooting #3 (ST)	Pipe Roth Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-39 Inspecting and measuring wear condition	AAVIM, Vol. 2 (ST) LA, Engine (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-40 Disassembling and inspecting component parts	AAVIM, Vol. 2 (ST) LA, Engine (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-41 Reassembling and replacing component parts	AAVIM, Vol. 2 (ST) LA, Engine (ST)	Pipe Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
SE-42 Diagnosing 2-cycle engine problems	AAVIM, Vol. 2 (ST)	Pipe Roth Turner, v.2	AAVIM, Workbook Vol. 2 MAVCC, Student Manual

CURRICULUM AREA: Small Engine Service (cont'd)

TASK LISTING		INSTRUCTIONAL MATERIAL REFERENCES		
		Audio-Visuals	Textbooks	Student Materials
SE-45	Reassembling and replacing component parts	---	---	---
SE-46	Testing and reconditioning fuel injection system	---	---	---
SE-47	Diagnosing single cylinder diesel engine problems	---	---	---
SE-48	Inspecting and measuring wear condition (heavy duty small engines)	B&S, Twin cylinder Engines (ST) PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2
SE-49	Disassembling and inspecting component parts (heavy duty small engines)	B&S, Twin cylinder Engines (ST) PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2
SE-50	Reassembling and replacing components parts	PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2
SE-51	Testing and reconditioning fuel system	PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2
SE-52	Testing and Renewing Ignition system components	PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2
SE-53	Diagnosing Problems in Multi-cylinder engines	PH, Heavy Duty Small Engines (FS)	Drake	AAVIM, Workbook Vol. 2

CURRICULUM AREA: Small Engine Mechanics
Major Block: Equipment Repair

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ER-01 Inspecting the assembly	---	Tec. Pub.(1) (2) Turner	AAVIM, Workbook Vol. 2 MAVCC, Student Manual
ER-02 Sharpening and balancing the blade	---	Tec. Pub.(1) (2)	MAVCC, Student Manual
ER-03 Adjusting and replacing the wheels	---	Tec. Pub.(1) (2)	MAVCC, Student Manual
ER-04 Cleaning and lubricating the assembly	---	Tec. Pub.(1) (2)	MAVCC, Student Manual
ER-05 Inspecting and replacing drive mechanisms	PH, Heavy Duty Small Engines (FS)	Tec. Pub.(1) (2)	MAVCC, Student Manual
ER-06 Repairing frame damage	---	Tec. Pub.(1) (2)	---
ER-07 Installing short block assembly	---	Purvis Tec. Pub.(1) (2)	MAVCC, Student Manual
ER-08 Inspecting the tiller assembly	---	Purvis	MAVCC, Student Manual
ER-09 Cleaning and lubricating the assembly	---	Purvis	MAVCC, Student Manual
ER-10 Adjusting and replacing tiller wheels	---	---	MAVCC, Student Manual
ER-11 Inspecting and repairing the tiller controls and drive	PH, Heavy Duty Small Engines (FS)	---	MAVCC, Student Manual

Major Block: Equipment Repair (cont'd)

TASK LISTING		INSTRUCTIONAL MATERIAL REFERENCES		
		Audio-Visuals	Textbooks	Student Materials
ER-12	Repairing tiller frame damage	---	---	---
ER-13	Installing a short block assembly	---	Purvis	MAVCC, Student Manual
ER-14	Handling the chain saw safely	Homelite, "Do It Right" (MF)	Tec. Pub. (4)	MAVCC, Student Manual Manufacturer's Handbook
ER-15	Identifying the component parts of the chain saw	---	Tec. Pub. (4)	MAVCC, Student Manual
ER-16	Servicing the chain saw assembly	---	Tec. Pub. (4)	MAVCC, Student Manual
ER-17	Maintain bar, chain and clutch	---	Tec. Pub. (4)	MAVCC, Student Manual
ER-18	Testing, removing, and replacing chain saw ignition system components	---	Tec, Pub. (4)	---
ER-19	Reconditioning the carburetor and fuel system components	---	Tec. Pub. (4)	---
ER-20	Repairing the starting system	---	Tec. Pub. (4)	---
ER-21	Disassembling and inspecting the chain saw power unit	---	Tec. Pub. (4)	---

Major Block: Equipment Repair (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ER-22 Reassembling the chain saw power unit	---	Tec. Pub. (4)	---
ER-23 Diagnosing chain saw problems	---	Tec. Pub. (4)	---

CURRICULUM AREA: Small Engine Mechanics
Major Block: Marine Engine Repair

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ME-01 Identifying the component parts	GA, ME-7 (ST) Cook, Marine Engine Lectures (FL) Delmar, (TR) Merc, Power Head Overhaul (ST)	Purvis Roth	GA ME-7 Disassembling power head and identifying component parts Cook, Workbook 17 MAVCC, Student Manual
ME-02 Testing, removing and replacing magneto ignition system components	GA, ME-1, 4 (ST) Cook, Marine Engine Lectures (FL)	Purvis Roth	GA ME-1 Describing 6 to 25 HP magneto ignition system ME-4 Troubleshooting 6 to 25 HP magneto ignition system ME-13 Testing coils, condensor and points BIA, Specifications Manual OMC, Technical Guide
ME-03 Testing, removing and replacing electronic ignition system components		OMC Roth	OMC, Technical Guide BIA, Specifications Manual
ME-04 Removing the power head from the lower unit	GA, ME-7 (ST)	Purvis	GA ME-7 Disassembling power head and identifying component parts MAVCC, Student Manual

Major Block: Marine Engine Repair (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ME-05 Reconditioning the carburetor and fuel system components	Cook, Marine Engine Lectures (FL) GA, ME-5, 11, 12 (ST)	Pipe Purvis Roth	Cook, Program 17 GA ME-5 Troubleshooting 6 to 25 HP fuel system ME-11 Cleaning, inspecting and repairing a carburetor ME-12 Repairing a fuel pump and filter MAVCC, Student Manual
ME-06 Disassembling and inspecting the power head	GA, ME-7 (ST) Cook, Marine Engine Lectures (FL) Merc, Power Head Overhaul (ST)	Purvis Roth	GA ME-7 Disassembling power head and identifying component parts Cook, Program 17
ME-07 Reassembling the power head	GA, ME-9 (ST) Merc, Power Head Overhaul (ST)	Purvis Roth	GA ME-9 Assembling power head and measuring parts for wear Cook, Program 17
ME-08 Testing the motor in the tank	Cook, Marine Engine Lectures (FL)	Purvis	Cook, Program 17 BIA, Specifications Manual
ME-09 Making final adjustments	Cook, Marine Engine Lectures (FL)		Cook, Program 17

Major Block: Marine Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ME-10 Diagnosing problems in the outboard power head	Delmar, (TR) Cook, Marine Engine Lectures (FL) GA, ME-7 (ST)	Purvis	GA ME-7 Disassembling power head and identifying component parts Cook, Program 17
ME-11 Identifying the component parts	GA, ME-8 (ST) Cook, Marine Engine Lectures (FL) Delmar, (TR) Merc, Gear Housing Disassembly (ST)	Purvis	GA ME-8 Disassembling lower unit and identifying component parts Cook, Workbook MAVCC, Student Manual
ME-12 Replacing propellers	Cook, Marine Engine Lectures (FL) Delmar, (TR)	Purvis	Cook, Workbook MAVCC, Student Manual
ME-13 Inspecting and replacing the water pump and component parts	GA, ME-10 (ST) Merc, Gear Housing Reassembly (ST)	Purvis	GA ME-10 Assembling lower unit and measuring parts for wear MAVCC, Student Manual
ME-14 Disassembling and inspecting gear drive assembly	GA, ME-8 (ST) Merc, Gear Housing Disassembly (ST)	Purvis	GA ME-8 Disassembling lower unit and identifying component parts Cook, Workbook MAVCC, Student Manual

Major Block: Marine Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ME-15 Reassembling the gear drive	GA, ME-10 (ST) Merc, Gear Housing Reassembly (ST)	Purvis	GA ME-10 Assembling lower unit and measuring parts for wear MAVCC, Student Manual
ME-16 Mounting the lower unit to the power head	GA, ME-9 (ST)	Purvis	GA ME-9 Assembling power head and measuring parts for wear BIA, Specifications Manual
ME-17 Mounting the motor on the boat			BIA, Specifications Manual
ME-18 Making control adjustments			BIA, Specifications Manual MAVCC, Student Manual
ME-19 Diagnosing problems in the lower unit	GA, ME-6 (ST)	Purvis	GA ME-6 Troubleshooting 6 to 25 HP drive train BIA, Specifications Manual
ME-20 Winterizing and storing the outboard motor	GA, ME-16 (ST)	BIA Purvis	GA ME-16 Winterizing and storing a marine engine
ME-21 Installing Motor Controls	---	BIA MAVCC, Outboard Repair	MAVCC, student manual

Major Block: Marine Engine Service (cont'd)

TASK LISTING	INSTRUCTIONAL MATERIAL REFERENCES		
	Audio-Visuals	Textbooks	Student Materials
ME-22 Installing steering mechanisms	---	BIA	---
ME-23 Installing marine accessories	---	BIA	---
ME-24 Making fiberglass repairs	---	BIA	---
ME-25 Placing boat on the trailor	---	BIA	---
ME-26 Repairing trailor lighting	---	BIA	---
ME-27 Repairing the trailor frame	---	---	---
ME-28 Replacing wheel bearings	---	---	---

TEXTBOOK LIST

Althouse, A.D. Turnquist, C.H. & Bowditch, W.A., Modern Welding. South Holland, IL: Goodheart-Willcox, 1980.

American Association for Vocational Instructional Materials, Ball and Roller Bearings. Athens, GA: AAVIM, 1966.

American Association for Vocational Instructional Materials, Developing Shop Safety Skills. Athens, GA: AAVIM, 1979.

American Association for Vocational Instructional Materials, Selecting and Storing Fuels and Lubricants. Athens, GA: AAVIM, 1973.

American Association for Vocational Instructional Materials, Small Engines (Vol. 1, 2). Athens,GA: AAVIM, 1979.

American Association for Vocational Instructional Materials, Understanding Electricity and Electrical Terms. Athens, GA: AAVIM, 1974.

Boating Industry Association (BIA), Marine Service (6th ed.). Chicago, IL: 1979.

Briggs & Stratton, Repair Instructions IV. Milwaukee: Author.

Drake, G.R., Small Gasoline Engines: Maintenance, Troubleshooting, and Repair. Reston, VA: Prentice-Hall, 1981.

Crouse, W.H. & Anglin, D.L., Automotive Tools, Fasteners and Measurements. Hightstown, NJ: McGraw-Hill, 1977.

Georgia Department of Education, Division of Vocational Education, Vocational Mathematics. Atlanta: GDE.

Jensen, L.E. & Brazier, W.A., Related Science-Automotive Trades. Albany, NY: Delmar.

Ohio State, Shop Safety. Columbus, OH: Trade and Industrial Education, Author.

Outboard Marine Corp., Service and Repair Manual. Waukegan, IL: Author, 1981

Olivio, T.C., Practical Problems in Mathematics for Specific Trades. Albany, NY: Delmar.

Pipe, T., Small Gasoline Engines Training Manual (3rd ed.). Indianapolis: Howard W. Sams, 1979.

Purvis, J., All About Small Gas Engines. South Holland, IL: Goodheart-Willcox, 1960.

Roth, A.C., Small Gas Engines. South Holland, IL: Goodheart-Willcox.

Stephenson, G.E., Power Technology. Albany, NY: Delmar, 1973.

Stovett. How to Read, Use and Care for Micrometers and Vernier Gages. Athol, MA.

[4]Technical Publications, Chain Saw Service Manual (6th ed.). Overland Park, KS: Author.

[3]Technical Publications, Large Air-Cooled Engines Service Manual (2nd ed.). Overland Park, KS: Author.

[2]Technical Publications, Riding Lawn Mower Service Manual. Overland Park, KS: Author, 1980.

[1]Technical Publications, Walking Lawn Mower Service Manual. Overland Park, KS: Author, 1980.

Turner, J.H., Small Engines (Vol. 1, 2). Athens, GA: AAVIM, 1979.

Wilton & Rogers, Shop Mathematics at Work. Silver-Burdett Publishing Co.

A bibliography of Vocational Education resource materials in Trade and Industrial Education is available from:

Wisconsin Vocational Studies Center
University of Wisconsin-Madison
964 Educational Sciences Building
1025 W. Johnson Street
Madison, WI 53706

AUDIO VISUALS AND STUDENT MATERIALS

Addresses for audio visuals and student materials, referenced in the unit guide sheets and listed on the Instructional Resource Matrix, are listed in the Additional Resources section. Materials developed by the State of Georgia are available from the Vocational Education Materials Center, University of Georgia.

ADDITIONAL INSTRUCTIONAL RESOURCES

In addition to the instructional resources listed in this section some small engine and outboard motor manufacturer's invite vocational instructors to attend their factory schools and/or offer training engines and software at very low prices. The small engine mechanics instructor is encouraged to request information relating to their vocational program from the following:

Briggs & Stratton Corp.
Attn. Education Department
P.O. Box 702
Milwaukee, WI 53201

Techumseh Products Company
Parts Depot
Grafton, WI 53024

Mercury Marine
Attn. Service Training Manager
1939 Pioneer Road
Fond du Lac, WI 54935

OMC Training Center
Attn. Mr. Kevin White
6852-A Nolan Road
Morrow, GA 30260

Deutz Corporation
Attn. Literature Department
7585 Ponce de Leon Circle
Atlanta, GA 30340

Lombardini Engines, Inc.
Attn. Don Deitmuller
3402 Oakcliff Road
Atlanta, GA 30345

Boating Industry Association
401 N. Michigan Avenue
Chicago, IL 60611
(Request Marine Service Manual
and BIA Certification Handbook.)

In the event that the instructor desires to include motorcycle mechanics in the small engine program, curriculum materials are available from:

Mid-America Vocational Curriculum Consortium
1515 West Sixth Avenue
Stillwater, OK 74074

ADDITIONAL INSTRUCTIONAL RESOURCES

Item: Manufacturer's Educational Materials

Resource	Product	Description
Allied Mowers P.O. Box 390 Pulaski, TN 38478	Lawn equipment	Manuals & literature
AMF Lawn & Garden Division P.O. Box 377 Des Moines, IA 50302	Riding lawnmowers & equipment	Manuals & literature
Beaird-Poulan-weed eater Division of Emerson Electric P.O. Box 9329 Shreveport, LA 71109	Chain saws String trimmers	Shop manuals, literature
Bolens (See FMC)		
Briggs & Stratton Corp. 3300 N. 124th Street Milwaukee, WI 53201	Small engines	Training aids, shop manuals & special tools
Crysler Marine 105 Marine Drive Hartford, WI 53207	Outboard motors	Training aids, shop manuals & special tools
Clinton Engine Corp. Maquoketa, Iowa 52060	Small engines	Training aids, shop manuals
Cushman Motors Lincoln, Nebraska 68500 (Division of Outboard Marine Corporation)	Small engines	Shop manuals
Detroit Engine Corp. 285 Piquette Street Detroit, MI 48200	Small engines	Shop manuals
Deutz Corporation 7585 Ponce de Leon Circle Atlanta, GA 30340	Small & large diesel engines	Shop manuals, special tools
Didier Mfg. Co. P.O. Box 163, Dept, 700 Franksville, WI 53126	Log splitters	Manuals & literature

Resource	Product	Description
Echo, Inc. P.O. Box 678 3150 MacArthur Blvd. North Brook, IL 60062	Chain saws & power equipment	Manuals & literature
FMC Corp. Outdoor Power Equipment Div. Port Washington, WI 53074	Bolens lawn & garden equipment	Manuals & literature
Garden Way Mfg. Company 102nd Street, 9th Avenue Troy, NY 12180	Troy-Bilt garden tractors	Manuals & literature
Gravely Tractors 4400 Gravely Tractors Dunbar, WV 25064 (Division of Studebaker Corporation)	Lawn & garden equipment	Shop manuals
Green Machine (See HMC)		
Hatz Diesel of America 2867 South 160th Street New Berlin, WI 53151	Small & large diesel engines	Shop manuals, special tools
HMC 20710 Alameda Street Long Beach, CA 90818	Green machine string trimmer	Manuals & literature
Homelite Division of Textron 14410 Carowinds Blvd. Charlotte, NC 28217	Chain saws, trimmers, power equipment	Manuals & literature, Safety film "Do It Right" (available on loan free of charge)
Honda Motor Company, Ltd. Tokyo, Japan	Small engines 2-cycle	Training aids, shop manuals, special tools
Huffy (See Saile)		
Huski 2132 Hawkins Street Charlotte, NC 28203	Husqvarna chain saws	Manuals & literature
Husqvarna (See Huski Power)		
Jacobson/Homelite Division of Textron 14401 Carowinds Blvd. Charlotte, NC 28217	Lawnmowers, power equipment & chain saws	Manuals & literature

Resource	Product	Description
Jonesreds (See Tiller)		
Kohler Company Kohler, WI 53044	Small heavy duty engines	Shop manuals, special tools
Lazy Boy Lawn Mower Co. 1315 West 8th Street Kansas City, MO 61101	Lawn equipment	Manuals & literature
Lombardini Engines 3402 Oakcliff Road Atlanta, GA 30331	Small diesel engines	Shop manuals, special tools
Mercury Marine 1939 Pioneer Road Fond du Lac, WI 54935	Outboard motors	Training aids, shop manuals, special tools
Merry Mfg. Company Marysville, WA 98270	Roto-tillers	Manuals & literature
McCulloch Corp. P.O. Box 92180 5400 Alla Street Los Angeles, CA 90009	Chains, trimmers, generators & accessories	Manuals & literature, Safety film "Do It Right" (available on loan, free of charge)
McDonough Power Equipment McDonough, GA 30253	Snapper power equipment	Shop manuals, literature
MTD 5965 Grafton Road P.O. Box 36900 Cleveland, OH 44136	Lawn & garden equipment & supplies	Manuals, literature catalog
Murray Box 268 Brentwood, TN 37027	Lawn & garden equipment	Manuals, literature
Onan Minneapolis, MN 55432	Small heavy duty engines	Shop manuals
Outboard Marine Corp. 100 Sea-Horse Drive Waukegan, IL 60085	Outboard motors & Lawn-Boy power mowers	Training aids, shop manuals, special tools
O & R Engines, Inc. 3340 Emery Street Los Angeles, CA 90023	Small engines 2-cycle	Shop manuals

Resource	Product	Description
Roper Sales Corporation 1405 West Court Street Kanakee, IL 60901	Lawn & Garden equipment	Manuals & literature
Rugg (See Saile)		
Saile Mower Parts P.O. Box 2822 Pittsburg, PA 15230	Parts for Rugg & Huffy lawnmowers	Microfiche parts catalog
Small Engine Distributors 1000 West 12th Street Kansas City, MO 64101	Production over runs of engines and parts (excellent source for training engines)	Write on school letterhead to request placement on mailing list.
Snapper (See McDonough)		
Stihl, Inc. Oceana West Industrial Park 536 Viking Drive Virginia Beach, VA 23452	Chain saws trimmers, power equipment	Manuals, literature & audio visuals
Tecumseh Products Company Grafton, WI 54436 (Lauson-Power Products Engine Division)	Small engines (Lauson 4-cycle power products 2-cycle)	Training aids, shop manuals, special tools
Tilton Equipment Co. 4612 North Chatsworth St. St. Paul, MN 55112	Jonsereds chain saws	Manuals & literature
Toro Company 8111 Lyndale Avenue South Bloomington, IL 55420	Lawn & garden equipment	Manuals & literature
Troy Bilt (See Garden Way)		
Waukesha Diesel Engines 1000 West St. Paul Ave. Waukesha, WI 53185	Small & large diesel engines	Shop manuals, special tools, etc.
West Bend Corporation Hartford, WI 53027 (Hartford Division of Crysler Outboard Corp.)	Outboard motors	Shop manuals,
Weed Eater (See Beaird-Poulan)		

Resource	Product	Description
Wheel Horse Lawn & Garden Tractors 515 West Irland Road South Bend, IN 46614	Lawn & garden equipment	Manuals & literature
Wisconsin Motor Company 19 South 53rd Street Milwaukee, WI 53219	Small gas & diesel engines	Shop manuals, special tools, charts, etc.
Yazoo Mower Co. P.O. Box 4449 3607 Livingston Road Jackson, MS 39216	Lawnmowers	Parts list

ADDITIONAL INSTRUCTIONAL RESOURCES

Item: Publishers of Textbooks, Audio Visuals and Student Materials

Resource	Product	Description
AAVIM 120 Engineering Center Athens, GA 30602	Textbooks & audio visuals	Small engine repair teacher & student materials with slides & transparancies
American Technical Publishers, Inc. 5608 Stony Island Ave. Chicago, IL 60637	Textbooks	Power mechanics
Automated Training, Inc. 1401 S. Mint St., Box 34707 Charlotte, NC 28234	Audio visuals	Film loops & filmstrips in small engine repair
Bergwall Productions, Inc. Gordon City, NY 11530	Audio visuals	Filmstrips in small engine repair
Briggs & Stratton Corp. P.O. Box 702 Milwaukee, WI 53201 ATTN: Education Department	Educational program (write for details)	Many free or low cost items, seminars, etc. for the small engine instructor
Charles A. Bennett Co., Inc. 809 W. Detweiller Drive Peoria, IL 61615	Textbooks	Power mechanics
DCA Educational Products 424 Valley Road Warrington, PA 18976	Audio visuals	Transparancies & film loops in small engine repair
Delmar Publishers 7625 Empire Drive Florence, KY 41042	Textbooks	Small engine repair, math & science textbooks for trades
Goodheart-Wilcox Co. 123 W. Tart Drive South Holland, IL 60473	Textbooks	Small engine repair

Resource	Product	Description
Hobar Publications 1234 Tiller Lane St. Paul, MN 55112	Catalog of instructional materials	A compilation of different manuf. of audio visuals, texts, tools, etc. for small engine repair
Howard W. Sams & Co., Inc. 4300 West 62nd St. Indianapolis, IN 46206	Textbooks & service manuals	Small engine repair
Lauson - Power Products	(See Tecumseh Products)	
MAVCC 1515 W. Sixth Ave. Stillwater, OK 74074	Student materials	Units in motorcycle, chain saw, small engine & outboard repair
McGraw-Hill P.O. Box 996 Norcross, GA 30091	Textbooks	Large selection of small engine mechanics also student materials
McKnight Publishing Co. Bloomington, IL 61701	Textbooks	Power mechanics
Mercury Marine 1939 Pioneer Road Fond du Lac, WI 54935 ATTN: Service Training Mgr.	Educational program & materials (write for details)	Service training schools, training aids, & technical publications
Prentice-Hall Media ServCode XF 150 White Plains Rd. Tarrytown, NY 10591	Textbooks & audio visuals	Small engine repair for light & heavy duty engines
School Media Associates 2620 Caladium Drive, N.E. Atlanta, GA 30345	Audio visuals	A compilation of various manuf. of slides, filmstrips, transparencies & student materials in diesel & small engines

Resource	Product	Description
Technical Publications P.O. Box 12091 Overland Park, KA 66212	Textbooks & repair manuals	Small engine repair
Tecumseh Products Co. Parts Depot 900 N. Street Grafton, WI 53024	Educational program (write for details)	Many free or low cost items, seminars, etc. for the small engine instructor
University of Missouri-Columbia 10 Industrial Education Building Columbia, MO 65211	Catalog of instructional materials	A compilation of materials available from universities & manuf. for small engine mechanics

ADDITIONAL INSTRUCTIONAL RESOURCES

Item: Comprehensive Repair Manuals

Resource	Product	Description
Clymer Publications 12860 Muscatine St. P.O. Box 20 Arleta, CA 91331	Motorcycle repair manuals	Repair manual for specific motorcycle models
Chilton Book Company Chilton Way Radnor, PA 19089	Motorcycle Repair Manual	Published yearly for most models of motorcycles
Regnery Publishing Co. 112 West Illinois St. Chicago, IL 60610	Glenn's Marine Series	Repair manuals for specific marine models
Technical Publications P.O. Box 12901 Overland Park, KA 66212	Chain Saw Service Manual; Motorcycle Service Manual; Outboard Motor Service Manual (Vol. 1, 2); Small Air Cooled Engines Service Manual; Large Air Cooled Engines Service Manual; Walking Lawnmower Service Manual; Riding Lawnmowers Service Manual	Repair & flat rate manuals for most small engine powered equipment

ADDITIONAL INSTRUCTIONAL RESOURCES

Item: Tools and Equipment

Resource	Product	Description
Alemite Division Stewart-Warner Corp. 1826 W. Diversey Parkway Chicago, IL 60614	Lubrication equipment	Grease guns, pumps, etc.
Allen Electric & Equipment 2101 N. Pitcher St. Kalamazoo, MI 49007	Electrical test equipment	Charging system testers, etc.
Ammoco Tools, Inc. 2100 Commonwealth Ave. North Chicago, IL 60064	Small engine tools	Hones, special wrenches, etc.
Auto-Test, Inc. 411 West 8th St. Neillsville, WI 54456	Test equipment	Engine test equipment, etc.
Balcrank Products Wheelabrator-Frye, Inc. 400 South Byrkit Ave. Mishawaka, IA 46544	Lubrication equipment	Grease guns, pumps, etc.
Black & Decker Manufacturing Company Towson, MD 21204	Air & electric tools & equipment	Air wrenches, electric drills, etc., valve grinding equipment
Blackhawk Manufacturing Co. Applied Power Industries Box 8720 Milwaukee, WI 53227	Tools	Jacks, stands, hand tools
E. Edelmann & Company Chicago, IL 60647	Tools	Line flaring tools & fittings
Fox Valley Instrument Co. Sheboygan, MI 49721	Test equipment	Timing lights, meters, etc.
Graham Research, Inc. Minneapolis, MN 55418	Small engine electrical test equipment	Coil testers, etc.

Resource	Product	Description
Herband,Kelsey Hayes Tool Division Orangeburg, SC 29115	Hand tools	Wrenches, hammers, etc.
Ingersol Rand/Proto Tool Co. 2309 Santa Fe Avenue Los Angeles, CA 90058	Hand & power tools	Air wrenches, hand tools, etc.
Kal-Equip Company 411 Washington St. Otsego, MI 49078	Test equipment .	Small engine electrical test meters, etc.
K-D Manufacturing Co. Hempland Road Lancaster, PA 17604	Special tools	Small engine tools & repair equipment
Lisle Corp. Clarinda, IA 51632	Special tools & engine repair equipment	Bearing drivers, cyliner hones, seal pullers, etc.
Mac Tools, Inc. Washington Court House OH 43160	Hand tools	Wrenches, sockets, test equipment, etc.
Marquette Corp. 307 East Hennepin Ave. Minneapolis, MN 5514	Test equipment	Battery chargers, testers, etc.
Merc-O-Tronic Instruments Corp. 215 Branch St. Almont, MI 48003	Small engine & outboard motor ignition test equipment	Electronic ignitions, testers, etc.
Morris Tools 724 Penryn Road Manheim, PA 17545	Tools	Speciality tools & equipment for small engine repair
Neway Sales, Inc. Corunna, MI 48817	Small engine valve tools	Valve seat cutter, valve tools
Owatonna Tool Company P.O. Box 268 Owatonna, MN 55060	Special tools, pullers	Bearing & gear pullers, etc.

Resource	Product	Description
P & C Hand Tool Co. P.O. Box 22066 Portland, OR 93222	Hand tools	Wrenches, sockets, etc.
Proto Tool Division Ingersol Rand Corp. 3900 Wesley Terrace Schiller Park, IL 60176	Hand tools	Wrenches, sockets, etc.
Rockwell International Power Tool Division 6263 Poplar Avenue Memphis, TN 37901	Air & electric tools	Air wrenches, electric drills, etc.
S. K. Wayne Tool Co. Chicago, IL 60604	Hand tools	Wrenches, sockets, etc.
Sioux, Inc. 2901 Floyd Blvd. Sioux City, IA 51102	Valve grinding equipment	Valve grinders, seat grinders, etc.
Snap-On Tools Corp. 8028 28th Avenue Kenosha, WI 53140	Hand tools & repair equipment	Wrenches, sockets, test equipment, etc.
Stewart-Warner Corp. Alemite & Instrument Division 1826 Diversey Parkway Chicago, IL 60614	Guages, special tools	Lubrication equipment, etc.
Sun Electric Corp. Harlem & Avondale Chicago, IL 60631	Test equipment	Ignition & exhaust analyzer, electric systems test equipment
Sunnen Products Co. St. Louis, MO 63143	Engine repair tools	Cylinder homes, ridge reamers
Zim Manufacturing Co. Cambridge, MA 01922	Small engine repair tools	Valve tools, etc.

ADDITIONAL INSTRUCTIONAL RESOURCES

Item: Parts and Accessory Manufacturers and Sales

Resource	Product	Description
AC-Delco Division General Motors Corp. 400 Renaissance Center Detroit, MI 48243	Small engine parts & accessories	Batteries, spark plugs, fuel pumps, alternators, etc.
Auto-lite Division Ford Motor Company 1122 Milledge Drive East Point, GA 30344	Small engine parts & accessories	Batteries, spark plugs, fuel pumps, alternators, etc.
Carter Carburetor Division ACF Industries, Inc. Educational Aids Dept. P.O. Box 16092 Clayton, MO 63105	Small engine fuel system parts	Fuel system components
Champion Spark Plug, Co. P.O. Box 910 Toledo, OH 43601	Small engine parts	Spark plugs
Chicago Rawhide Manufacturing Co. 900 N. State St. Elgin, IL 60120	Small engine parts	Grease & oil seals
Colt Industries Fairbanks Morse Beloit, WI 53512	Small engine parts & accessories	Electrical equipment & accessories
CRC Chemicals Division of C.J. Webb, Inc. Limekiln Pike P.O. Box 100 Dresher, PA 19025	Lubricants	Lubricants, penetrants, cleaners
Dana Parts Corp. P.O. Box 500 Hagerstown, IN 47346	Small engine	Engine parts
Dixie Sales Co., Inc. P.O. Box 1408 Greensboro, NC 27402	Parts & supplies	Riding mower, tiller & push mower parts (write for catalog)
E. Edelmann & Co. Chicago, IL 60647	Small engine parts	Lines, tubings, fittings, etc.

Resource	Product	Description
Fel-Pro, Incorporated Skokie, IL 60076	Small engine gaskets	Gaskets & sealers
Fram Providence, RI 02916	Small engine filters	Fuel, air & oil filters
The Gates Rubber Co. 999 South Broadway Denver, CO 80217	Small engine parts	Belts & hoses
Gould Engine Parts Division St. Paul, MN 55101	Small engine parts	Pistons, rings, valves, etc.
The Goodyear Tire & Rubber Company Akron, OH 44309	Small engine parts	Tires, hoses, belts
Granberg 200 Garrad Blvd. Richmond, CA 94804	Tools & accessories for chain saws	Catalog
Hastings Mfg. Company Hastings, MI 49058	Small engine parts	Engine rebuild parts
Koppers Company Metal Products Division Baltimore, MD 21203	Small engine parts	Pistons, rings, etc.
McQuay-Norris Mfg. Co. St. Louis, MO 61300	Small engine parts	Pistons, rings, valves, etc.
Motorola, Inc. 1299 E. Algonquin Rd. Schaumburg, IL 60196	Electrical system parts & accessories	Electronic ignition parts, alternators, etc.
NAPA Distribution Center P.O. Box 2000 Norcross, GA 30091	Small engine parts & accessories	Parts & components for automotive & small engine systems
C. E. Niehoff & Co. 4925 Lawrence Avenue Chicago, IL 60630	Small engine parts	Ignition & electrical system parts
Pennzoil Oil City, PA 16301	Lubricants	Oil & grease
Prestolite P.O. Box 963 300 City Park Ave. Toledo, OH 43696	Parts & accessories	Electrical system components

Resource	Product	Description
Quaker State Oil Refining Corporation Oil City, PA 16301	Lubricants	Oil & grease
Ramsey Corporation St. Louis, MO 63166	Small engine parts	Pistons, rings, etc.
Scintilla Division Bendix Aviation Corp. Sidney, NY 13838	Small engine accessories	Ignition & electrical parts
Shell Film Library 1433 Sadlier Circle W. Dr. Indianapolis, IN 46239	Lubricants	Oil & grease (training films available)
Sunnen Products Company St. Louis, MO 63143	Engine rebuild tools	Hones, ridge reamers, etc.
Tillotson Mfg. Co. Parts & Service Division Toledo, OH 43600	Small engine carburetors	Carburetors & fuel system parts
Valvoline Oil Company Division of Ashland Oil Co. Ashland, KY 41101	Lubricants	Oil & grease
Walbro Corporation Cass City, MI 48726	Small engine carburetors	Fuel system parts
Warner Electric Beloit, WI 53512	Small engine accessories	Electrical accessories
WICO Division Globe-Union, Inc. West Springfield, MA 01089	Small engine accessories	Magneto & electrical system parts

SECTION VII

STUDENT RECORDS

STUDENT RECORDS

This section contains three forms, the Individual Progress Report Chart, the Group Progress Chart and the Student Competency Record. The use of these charts is described below.

INDIVIDUAL PROGRESS REPORT. One copy should be kept in each student's confidential file and updated as tasks are completed. Grades should be assigned upon task completion and then averaged for grade reporting. Difficulty, excessive amounts of time, etc. should be noted on this form and should be discussed with the student.

GROUP PROGRESS CHART. This chart reflects task completion only and can be displayed in the classroom or lab area. Due to confidentiality of records, a grade must not be recorded. The instructor should maintain a copy of this record and update it daily.

STUDENT COMPETENCY RECORD. This record provides a listing of all tasks or units in the program, a space designated for the student's name, D.O.T. numbers and job title and a check off column for date of task completion. The D.O.T. number and job title should be filled in when the student leaves the program for any reason. The information will indicate his/her qualifications for a job. This information will be especially useful to early leavers who have not completed the total program. The Task Listing/D.O.T. Code Cross Reference Table in Section III contains the information required to identify the particular job title for which the student is qualified.

EXIT POINT TASK LIST

The following is a list of tasks which will enable a student to meet the requirements for the identified occupation.

Small Engine Mechanic 625.281-034	Gas Engine Repairer 625.281-026	Power Saw Mechanic 625.281-030
RI-01-15 SE-01-42 ER-01-23	RI-01-15 SE-01-53 ER-01-23	RI-01-15 SE-01-42 ER-14-23
Outboard Motor Mechanic 623.281-042	Diesel Mechanic Helper 625.684-010	Boat Rigger 806.464-010
RI-01-15 SE-01-42 ME-01-20	RI-01-15 SE-01-53	RI-01-15 ME-12; ME-17-18 ME-20-28

INDIVIDUAL PROGRESS REPORT

NAME ______________________________

PROGRAM/ __________________________ AREA __________________________
CLUSTER

TASK/ UNIT NO.	UNIT TITLE	DATE STARTED	DATE COMP.	EST. TIME	GRADE

RECORD OF DEMONSTRATED JOB COMPETENCIES

STUDENT NAME ______________________________ PROGRAM ______________________________

DICTIONARY OF OCCUPATIONAL TITLES JOB CLASSIFICATION: D.O.T. No. ______________________________

JOB TITLE ______________________________

Unit No.	Competency Demonstrated	Initial Date
	Related Instruction	
RI-01	Demonstrating & utilizing school & lab policies & procedures	
RI-02	Maintaining a parts inventory	
RI-03	Reading & interpreting the shop service manuals	
RI-04	Completing job work order forms	
RI-05	Identifying & maintaining shop tools & equipment	
RI-06	Using precision measurement tools & equipment	
RI-07	Demonstrating engine theories of operation	
RI-08	Demonstrating a knowledge of electricity fundamentals	
RI-09	Demonstrating a knowledge of fuels	
RI-10	Demonstrating a knowledge of lubricants	
RI-11	Demonstrating a knowledge of hardware & fasteners	
RI-12	Demonstrating basic metal operations	
RI-13	Demonstrating welding & soldering techniques	
RI-14	Demonstrating a knowledge of applied mathematics	
RI-15	Demonstrating a knowledge of applied science	
	Small Engine Fuel System	
SE-01	Servicing the fuel tank lines & filter	
SE-02	Servicing the air cleaner	
SE-03	Adjusting fuel/air mixtures & mechanical linkage	
SE-04	Reconditioning the float-type carburetor	
SE-05	Reconditioning the suction-lift-type carburetor	
SE-06	Reconditioning the diaphragm-type carburetor	
SE-07	Reconditioning fuel pumps	
SE-08	Repairing & adjusting governors	
SE-09	Diagnosing fuel system problems	
	Small Engine Ignition System	
SE-10	Inspecting, selecting & installing spark plugs	
SE-11	Timing the ignition system	
SE-12	Testing, removing & replacing magneto ignition components	
SE-13	Testing, removing & replacing battery ignition components	

Unit No.	Competency Demonstrated	Initial Date
SE-14	Testing, removing & replacing electronic ignition components	
SE-15	Diagnosing ignition system problems	
	Small Engine Starting System	
SE-16	Inspecting & repairing the rope-type starting system	
SE-17	Inspecting & repairing the wind-up starting system	
SE-18	Inspecting & repairing electric-type starting system	
SE-19	Diagnosing starting system problems	
	Small Engine Charging System	
SE-20	Testing & servicing storage	
SE-21	Testing & repairing DC generators & components	
SE-22	Testing & repairing AC generators & components	
SE-23	Testing & repairing the combination generator/starter & components	
SE-24	Diagnosing charging system problems	
	Small Engine Exhaust & Emission Control System	
SE-25	Removing & replacing mufflers & exhaust pipes	
SE-26	Cleaning 2-cycle exhaust system	
SE-27	Maintaining emission control devices	
SE-28	Diagnosing exhaust & emission control systems problems	
	Small Engine Valve Job	
SE-29	Checking valve operation	
SE-30	Grinding valves & valve seats	
SE-31	Inspecting & repairing the cylinder head	
SE-32	Adjusting valve clearances	
SE-33	Repairing 2-cycle engine valves	
SE-34	Diagnosing valve problems	
	Small Engine Overhaul (4-cycle)	
SE-35	Inspecting & measuring wear condition	
SE-36	Disassembling & inspecting component parts	
SE-37	Reassembling & replacing component parts	
SE-38	Diagnosing 4-cycle engine problems	

Unit No.	Competency Demonstrated	Initial Date
	Small Engine Overhaul (2-cycle)	
SE-39	Inspecting & measuring wear condition	
SE-40	Disassembling & inspecting component parts	
SE-41	Reassembling & replacing component parts	
SE-42	Diagnosing 2-cycle engine problems	
	Small Engine Overhaul (diesel)	
SE-43	Inspecting & measuring wear condition	
SE-44	Disassembling & inspecting component parts	
SE-45	Reassembling & replacing component parts	
SE-46	Testing & reconditioning fuel injection system	
SE-47	Diagnosing air cooled diesel engine problems	
	Heavy duty small engine overhaul (greater than 12 H.P.)	
SE-48	Inspecting & measuring wear condition	
SE-49	Disassembling & inspecting component parts	
SE-50	Reassembling & replacing component parts	
SE-51	Testing & reconditioning fuel system components	
SE-52	Testing & renewing ignition system components	
SE-53	Diagnosing heavy duty small engine problems	
	Service & Maintain Lawnmower Assemblies	
ER-01	Inspecting the assembly	
ER-02	Sharpening & balancing the blade	
ER-03	Adjusting & replacing the wheels	
ER-04	Cleaning & lubricating the assembly	
ER-05	Inspecting & replacing drive mechanisms	
ER-06	Repairing frame damage	
ER-07	Installing a short block assembly	
	Service & Maintain Garden Tiller Assemblies	
ER-08	Inspecting the assembly	
ER-09	Cleaning & lubricating the assembly	
ER-10	Adjusting & replacing wheels	
ER-11	Inspecting & repairing the control & drive mechanism	
ER-12	Repairing frame damage	
ER-13	Installing a short block assembly	
	Service & Maintain Chain Saw Assemblies	
ER-14	Handling the chain saw safely	
ER-15	Identifying the component parts	
ER-16	Servicing the assembly	
ER-17	Maintaining bar, chain & clutch	
ER-18	Testing, removing & replacing ignition system components	
ER-19	Reconditioning the carburetor & fuel system components	
ER-20	Repairing the starting system	
ER-21	Disassembling & inspecting the power unit	
ER-22	Reassembling the power unit	
ER-23	Diagnosing chain saw problems	
	Outboard Power Head Overhaul	
ME-01	Identifying the component parts	
ME-02	Testing, removing & replacing magneto ignition system components	
ME-03	Testing, removing & replacing electronic ignition system components	
ME-04	Removing the power head from the lower unit	
ME-05	Reconditioning the carburetor and fuel system components	
ME-06	Disassembling & inspecting the power head	
ME-07	Reassembling the power head	
ME-08	Testing the motor in the tank	
ME-09	Making final adjustments	
ME-10	Diagnosing problems in the outboard power head	
	Outboard Lower Unit Overhaul	
ME-11	Identifying the component parts	
ME-12	Replacing propellers	
ME-13	Inspecting & replacing the water pump and component parts	
ME-14	Disassembling & inspecting gear drive assembly	
ME-15	Reassembling the gear drive	
ME-16	Mounting the lower unit to the power head	
ME-17	Mounting the motor on the boat	
ME-18	Making control adjustments	
ME-19	Diagnosing problems in the lower unit	
ME-20	Winterizing & storing the outboard motor	
	Boat and Trailer Repairs	
ME-21	Installing motor controls	
ME-22	Installing steering mechanism	
ME-23	Installing marine accessories	
ME-24	Making fiberglass repairs	
ME-25	Placing the boat on the trailer	
ME-26	Repairing trailer lighting	
ME-27	Repairing the trailer frame	
ME-28	Replacing wheel bearings	

This is to certify that the student has demonstrated proficiency in the performance of the competencies and/or tasks indicated. These competencies and/or tasks have been determined to be the skills and knowledge that are necessary for entry level employment into the job classification indicated.

Date ________________________ Instructor ________________________

School ____________________________

SECTION VIII

SPECIAL NEEDS STUDENT

WORKING WITH SPECIAL NEEDS STUDENTS

Introduction

Special needs students are those who are designated as handicapped and/or disadvantaged. The 1976 vocational education amendment defines handicapped individuals as:

> Persons who are mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, health impaired, or persons with other specific disabilities, who by reason thereof require special education and related services and who cannot succeed in the regular vocational education programs.

In Title II of the 1976 education amendments disadvantaged persons are defined as:

> Persons (other than handicapped persons) who have academic or economic disadvantages and who require special services, assistance or programs in order to enable them to succeed in vocational education programs.

Federal legislation requires that these special people be given an opportunity to function in a regular classroom. This section provides information on how special needs students are identified and how they can be mainstreamed into regular educational environments.

Figure One presents a model depicting various activities of the process in identifying and mainstreaming special needs students. These activities are conducted at three levels: the system level, the school level and the classroom level. All three levels must work together if implementation of the process is to be effective.

Identification Of The Special Needs Student

Through a variety of pre-testing procedures, special needs students are identified and their potentials are evaluated at the system level. This evaluation process consists of collecting and assessing the following data for each student:

- -Medical History
- -Educational Records
- -Vocational Development
- -Communication Skills
- -Dexterity/Motor Skills
- -Adaptive Behavior

When this procedure has been completed, the system personnel refers the student to the appropriate school level personnel.

Development of the Plan

At the school level, an Individual Education Plan (IEP) is developed for each special needs student. An IEP is a written plan which describes the educational objectives, both long and short term, and the support services for a special needs student. The plan is developed by the school administration, special education personnel, teacher(s) directly involved with the student and the parent(s). In some cases, the student may help with the development.

Implementing the I.E.P.

The actual implementing of the I.E.P. begins at the classroom level. The purpose of the teacher dealing with the special needs student is to help the student set realistic goals, identify the barriers which make it difficult for the student to learn and adapt the curriculum and/or facilities with reference to the I.E.P. so the student can learn while overcoming personal barriers.

Special needs students have problems which hinder their learning. Therefore, a teacher's job becomes more complicated than when teaching "regular" students. Handicapped students may have a variety of problems - mental, physical and/or emotional.

Academically disadvantaged students may exhibit language deficiencies, reading and writing deficiencies, computational deficiencies and general educational deficiencies. Economically disadvantaged students may possess an inability to concentrate because their primary needs - food, shelter, clothing - are not adequately met due to lack of money.

By considering these problems, teachers can modify existing programs to accommodate the needs of special needs learners. Some suggestions which may prove beneficial in modifying an existing curriculum are listed below:

- Prepare instructional materials in greater detail and assign work in shorter units.
- Provide more frequent evaluation of student's progress and provide opportunities for remedial work.
- Be aware of the student's limited vocabulary.
- Be aware of the student's inability to understand abstractions and generalizations and prepare materials accordingly.
- Keep the student aware of his or her progress and make the student feel he or she can succeed.
- Use real teaching aids, live work and practical experiences whenever possible.
- Choose reading material which is at the student's level, interest and experience.
- Use constructive criticism only.
- Use peer instruction whenever possible.
- Allow the student to advance at his or her own pace.
- Use the part-to-whole learning concept in adapting materials.

Materials Which Can Be Used to Teach Disadvantaged

In Georgia an effective set of materials has been developed to be used with a program to help disadvantaged students adjust to life and work situations. This program is called CVAE or Coordinated Vocational Academic Education. The CVAE program is organized with a coordinator who is responsible for the type of instruction the students receive, and a team of teachers assigned to the coordinator who work cooperatively to help the disadvantaged students learn to enjoy school and become more successful students. CVAE materials include visuals in the form of synchronized slide/ tape presentations. These units are designed to help the disadvantaged student become more successful in school, learn good work habits, become an aware consumer, and develop a better self-image and appearance. (Although designed especially for disadvantaged students, CVAE may also be used in regular classroom situations). The vocational education teacher should work with the CVAE coordinator to design a program of study for the disadvantaged students in areas in which the student needs help.

In some cases, facilities, must be modified for handicapped special needs students. In general, as long as the classroom/ shop meets federal guidelines for barrier free design, extensive facility changes need not be made. For visually impaired students, for example, let the student locate in the classroom where he or she can see best even to the point of moving the desk or work station as a portable unit. In the case of orthopedically handicapped, some changes may have to be made to shop machinery to allow the student to use it. This may involve more convenient controls or special seating where the student would normally stand. In making these changes, special education expertise would be helpful.

GROUP PROGRESS CHART

NAME	UNITS/TASKS																				

SPECIAL NEEDS MAINSTREAMING MODEL

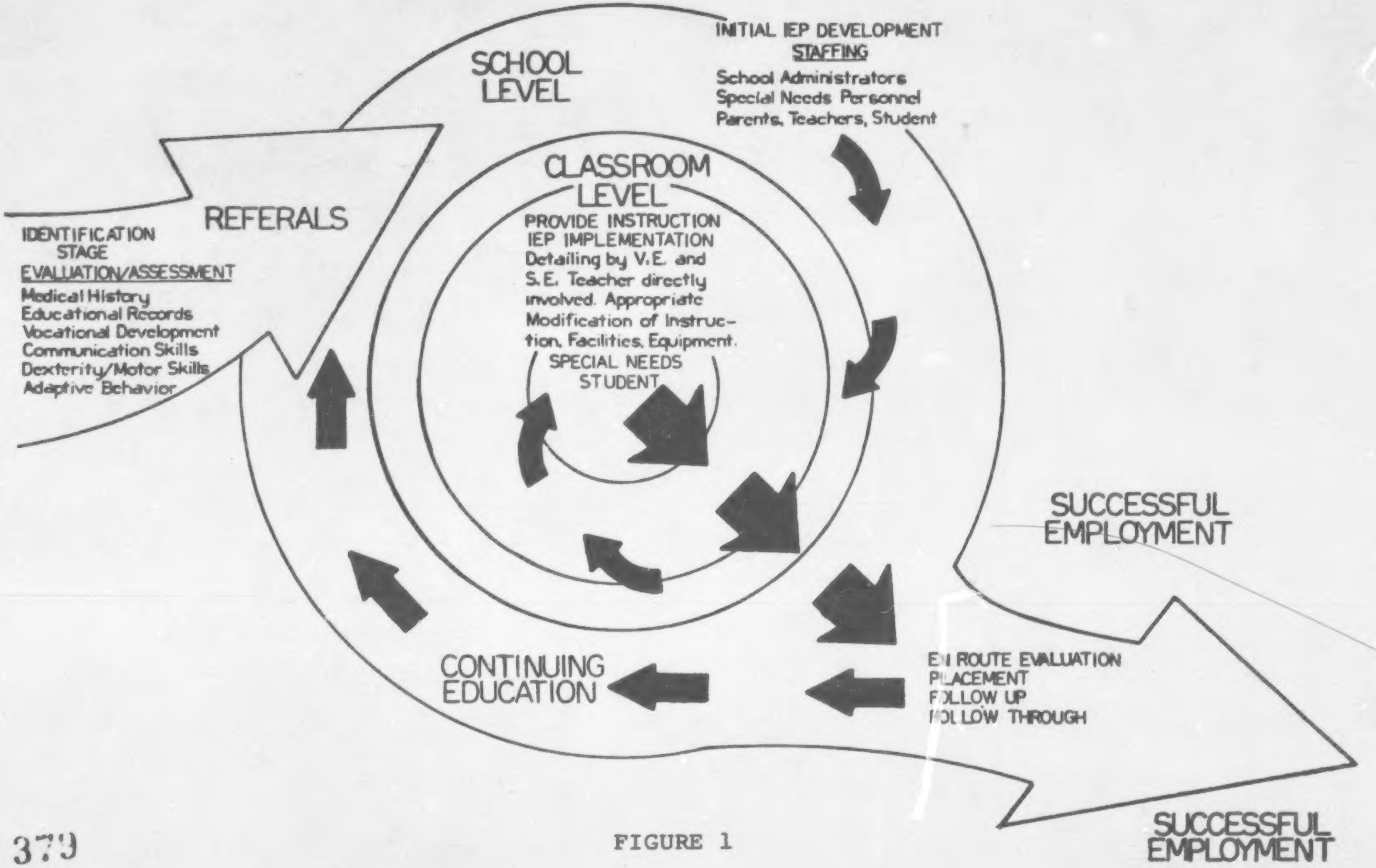

SCHOOL LEVEL
INITIAL IEP DEVELOPMENT
STAFFING
School Administrators
Special Needs Personnel
Parents, Teachers, Student
REFERALS
IDENTIFICATION STAGE
EVALUATION/ASSESSMENT
Medical History
Educational Records
Vocational Development
Communication Skills
Dexterity/Motor Skills
Adaptive Behavior
CLASSROOM LEVEL
PROVIDE INSTRUCTION
IEP IMPLEMENTATION
Detailing by V.E. and S.E. Teacher directly involved. Appropriate Modification of Instruction, Facilities, Equipment.
SPECIAL NEEDS STUDENT
SUCCESSFUL EMPLOYMENT
CONTINUING EDUCATION
EN ROUTE EVALUATION
PLACEMENT
FOLLOW UP
FOLLOW THROUGH
SUCCESSFUL EMPLOYMENT

FIGURE 1

Evaluation

Evaluation of the student's program should consist of:

- En-route evaluation (formative) to monitor the student's progress through the program.
- Summative evaluation upon completion of the program to determine job readiness.
- Follow-up after placement to determine if the student is successful on the job.
- Follow-through activities designed to identify any further training needed, which is indicated by the follow-up procedure.

Working with special needs students is much more demanding of the system, the school and the classroom teacher. However, with their patience and understanding, special needs students can not only succeed, but in many cases excell.

RESOURCES

To aid the teacher in modifying materials for special needs categories, the following references are listed by category. These are suggested references only as a world of materials exist on this subject.

Mentally Retarded

A Curriculum Guide for Teachers of Educable Mentally Retarded. Danville, Ill.: The Interstate Printers and Publishing Co., Inc.

High, Elizabeth C., and Moyers, Kathy L. Training Manual: Developing Pre-Vocational/Vocational Skills in Developmentally Disabled Persons. Washington, D.C.: Job Development Laboratory, George Washington University, 1976.

Kolstoe, Oliver P. Teaching Educable Mentally Retarded Children. Holt, Rinehart and Winston, 1976.

Mulligan, Robert E.; Gavin, Donald and Conaley, James. Comprehensive Career Education Curriculum Guide for the Trainable. New Brunswick, N.J.: Rutgers Vocational-Technical Curriculum Laboratory, 1977.

Introduction to Vocations for Educable Mentally Retarded. New Jersey: New Jersey Department of Education.

State of Ohio Curriculum Guide for Moderately Retarded Learners. Columbus, Ohio: Ohio Department of Education, 1977.

Tucker, Mark M. Learning through Curriculum Modification; A Blueprint to Teaching the Mentally Retarded. Johnstown, PA.: Mafex Associates, Inc., 1976.

Watson, Marjorie. Mainstreaming the Educable Mentally Retarded. Washington, D.C., NEA, 1975.

Hearing Impaired

Alvin, Howard P. The Evolution of an Evaluation Design for Evaluating Secondary Programs for the Deaf in Vocational Occupational-Technical Education (VOTE) Programs. ERIC - ED 123-241.

Guidelines: Educational Planning for the Hearing Handicapped. North Carolina Public Schools. Division for Exceptional Children, North Carolina Department of Public Instruction, Raleigh, N.C., 1977.

Munson, Harold L.; Eglston, Judy Cobb and Phillips, Gordon B. Career Education for Deaf Students: An Inservice Leader's Guide. University of Rochester, College of Education, Center for the Study of Helping Services, Rochester, N.Y. 1975.

Nix, Gary W. Mainstreaming Education for Hearing Impaired Children and Youth. Grune and Stratton, 1976.

Orthopedically and Other Health

A Model Plan for a Cooperative Vocational Rehabilitation Program. Office of Human Development, Rehabilitation Services and Administration. Department of Health, Education and Welfare, Washington, D.C.

Mallix, Kalisanker and Mueller, Jim. Vocational Aids and Enhanced Productivity of the Severely Disabled. The George Washington University Rehabilitation Research and Training Center, Washington, D.C. 1975.

McCarthy, Henry and Smart, Landon. Recommendations for Enhancing Employment Prospects of Handicapped Individuals. Comps. Human Resources Center, Albertson, L. I., 1978.

Duncan, John, et al. Environmental Modifications for the Visually Impaired: A Handbook. Visual Impairment and Blindness, December 1977, p. 442-455.

Disadvantaged

Guidelines for Methods and Techniques of Teaching Disadvantaged Students. Division of Vocational Education, Virginia Polytechnic Institute and State University, Blackburg, VA.

A Handbook for Developing Programs and Services for Disadvantaged Students. Department of Vocational Education Studies, College of Education, Southern Illinois, University of Carbondale, Carbondale, Ill. 62901

By Program

Adaption of Home Economics Curricula for Special Needs. North Dakota Research Coordination Unit, State Board for Vocational Education, State Office Building, Bismarck, ND.

Auto Body: An Adaptive and Developmental Program for Special Needs Students. Vocational-Technical Curriculum Laboratory, Rutgers - The State University, New Brunswick, N.J. 1976.

Floriculture Board of Cooperative Educational Services of Nassaw County, Division of Occupational Education, Division of Special Education, Westburg, NY 1975.

Grubb, Francine. *Basic Business* - A Teacher's Guide to an Employment Orientation Course for Special Needs Students. Vocational Technical Curriculum Laboratory, Rutgers - The State University, New Brunswick, N.J. 1976.

Home Economics and the Exceptional Student: A Handbook for Home Economics Teachers Working with Mentally Retarded Students. Vocational-Technical Curriculum Laboratory, Rutgers - The State University, New Brunswick, N.J. 1976.

Troutman, Carol M. *Introduction to Office Occupations*. Vocational-Technical Curriculum Laboratory, Rutgers - The State University, New Brunswick, N.J. 1974.

Working with the Handicapped in the Vocational Home Economics Classroom. Division of Vocational Education, State of Ohio, Columbus, Ohio.

Coordinated Vocational Education and Training (C.V.E.T.) manuals for disadvantaged, available from: Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, 1515 West Sixth Avenue, Stillwater, Oklahoma 74074.

-CVET Construction 3100219 Teacher's Guide
3100209 Student

-CVET General Mechanics 3100239 Teacher's Guide
3100229 Student

General Special Needs

A Handbook for Modifying Vocational Curricula for Handicapped Students. Wisconsin Vocational Studies Center, University of Wisconsin, Madison, May 1980.

Bottoms, J.E. and Scott, C.P. Supportive services for special student groups. In J.E. Wall (ed.), *Vocational Education for Special Groups*. Sixth Yearbook, Washington, D.C.: American Vocational Association, 1976.

Gill, Douglas H. and Scott, C. Paul. A practical model for mainstreaming handicapped learners in vocational education. *The Journal for Vocational Special Needs Education*, Vol. 1, No. 3, April, 1979, pp. 3-7.

Gugerty, J., et al. *Tools, Equipment and Machinery Adapted for the Vocational Educator and Employment of the Handicapped*. Project #498749006, Wisconsin Vocational Studies Center, Madison, Wisconsin, January 1981.

Hull, Marc E., Berry, Owen J. and Clark, Donald L. *Procedures for Teaching Vocational Concepts to Students with Special Needs*. Texas A & M University, Final Report Project 62350274, June 1976.

The Related Vocational Instruction Program. Georgia's Approach to Vocational Education for the Handicapped at the Secondary level, Douglas H. Gill, Project Coordinator, Vocational Programs for the Handicapped, Georgia Southern College, Statesboro, Georgia.

Vocational Educational Resource Materials, A Bibliography of Materials for Handicapped and Special Education. Third edition, 1976. Wisconsin Vocational Studies Center, University of Wisconsin - Madison.

SECTION IX

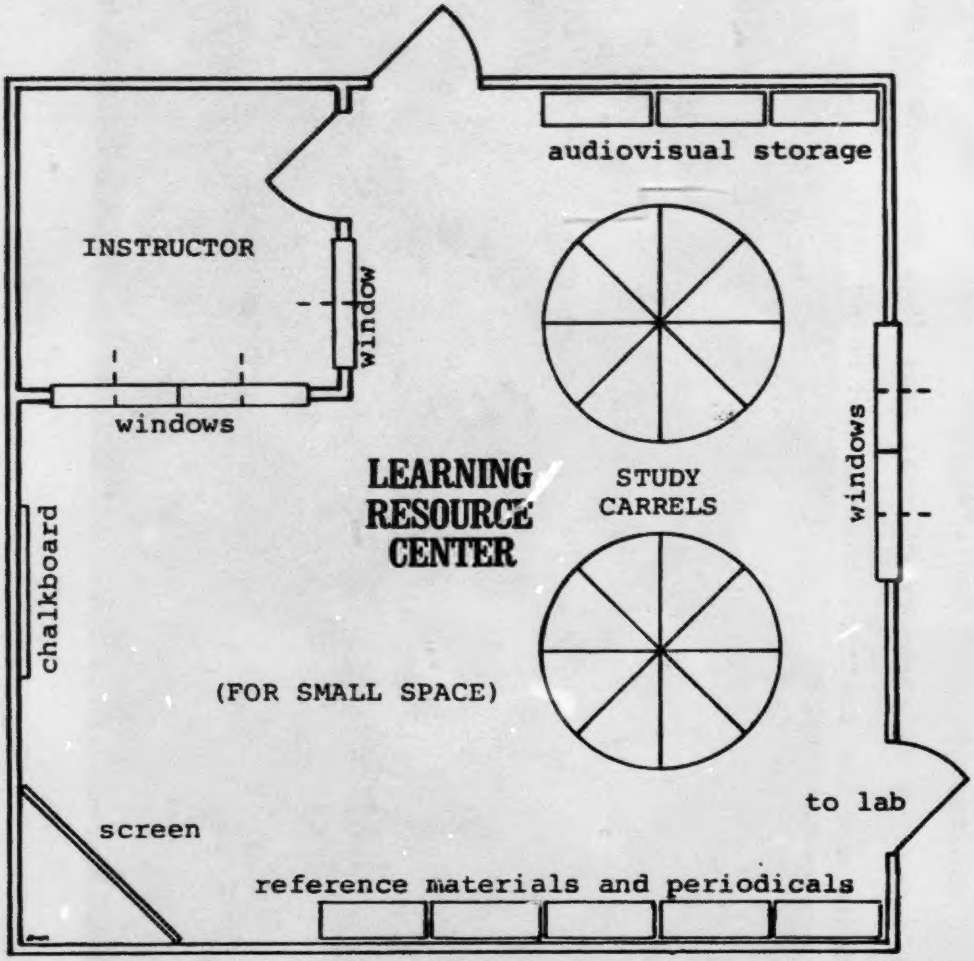
FACILITY LAYOUT

Facility Layout

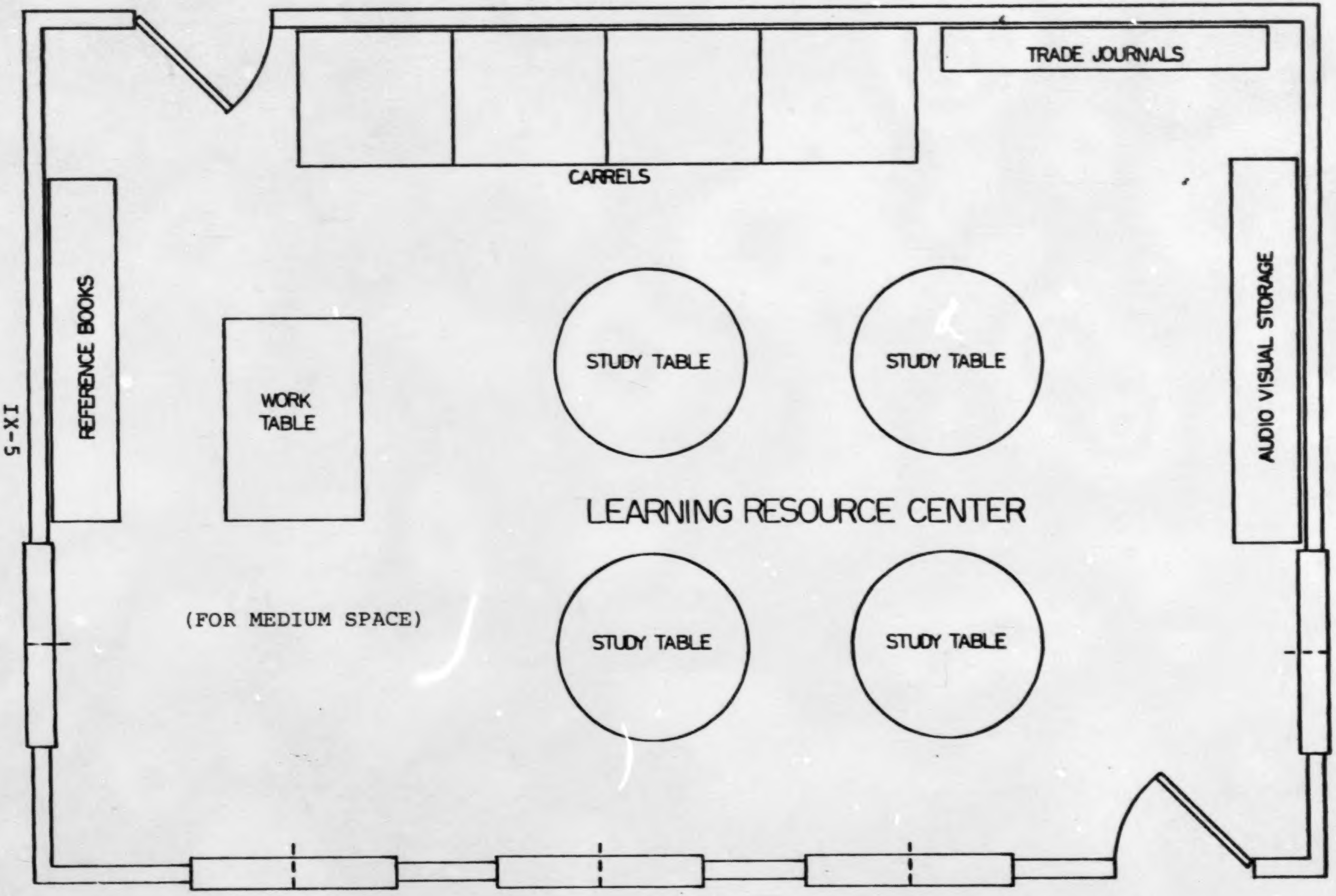
The facility layouts on the following pages are presented to aid in arranging the classroom and laboratory for efficient instruction. The three resource center arrangements represent small, medium and large centers. Ultimately the instructor must determine an arrangement that best fits the needs of the students and the instructional method being used.

The laboratory facility layout is one recommended by the teachers who helped develop the Small Engine Mechanics program materials. This facility is easily adaptable to a variety of arrangements that will best fit local needs.

These layouts may be especially useful in those schools where classroom renovation or construction is being planned.

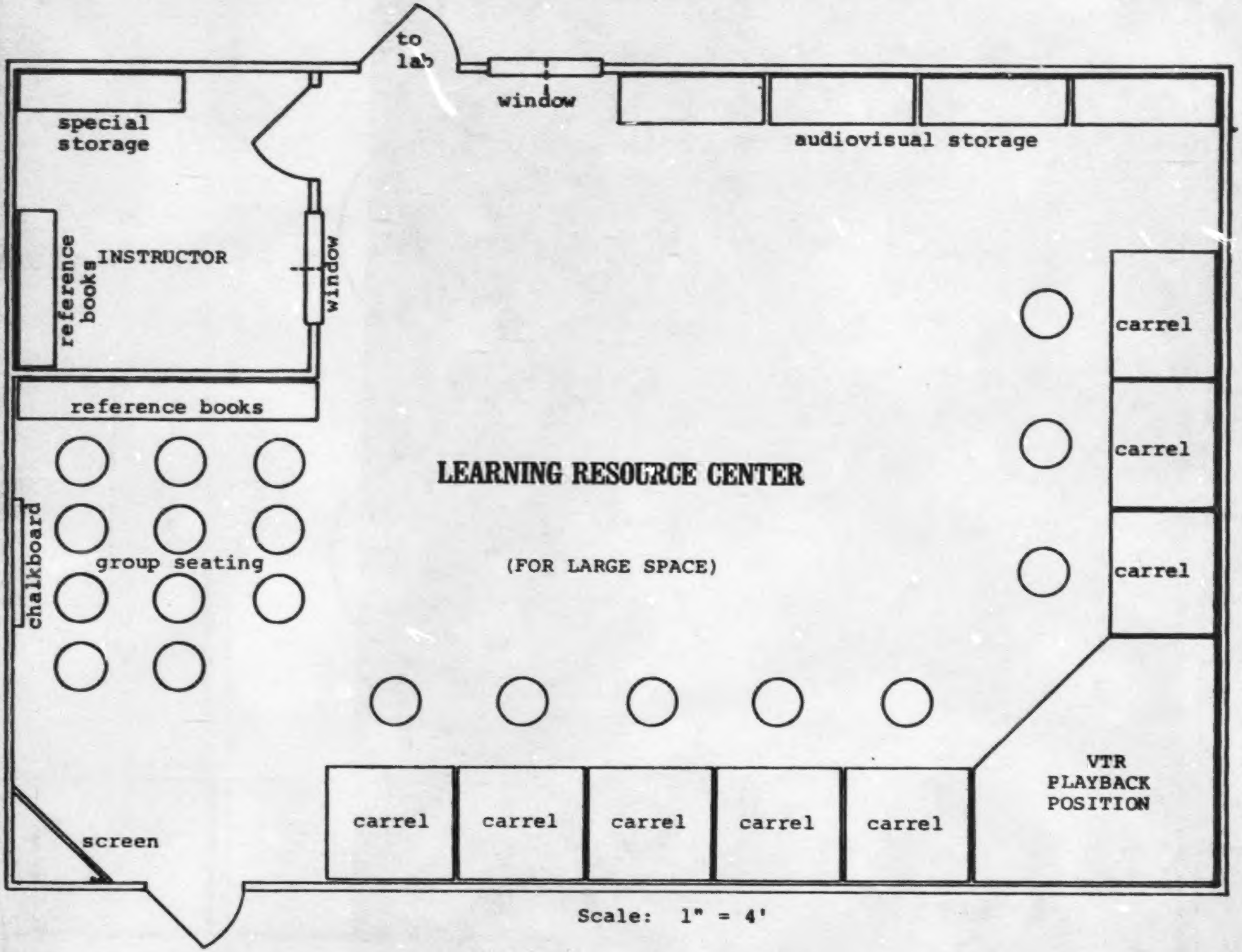

audiovisual storage
INSTRUCTOR
window
windows
LEARNING RESOURCE CENTER
STUDY CARRELS
windows
chalkboard
(FOR SMALL SPACE)
to lab
screen
reference materials and periodicals

Scale: 1" = 4'

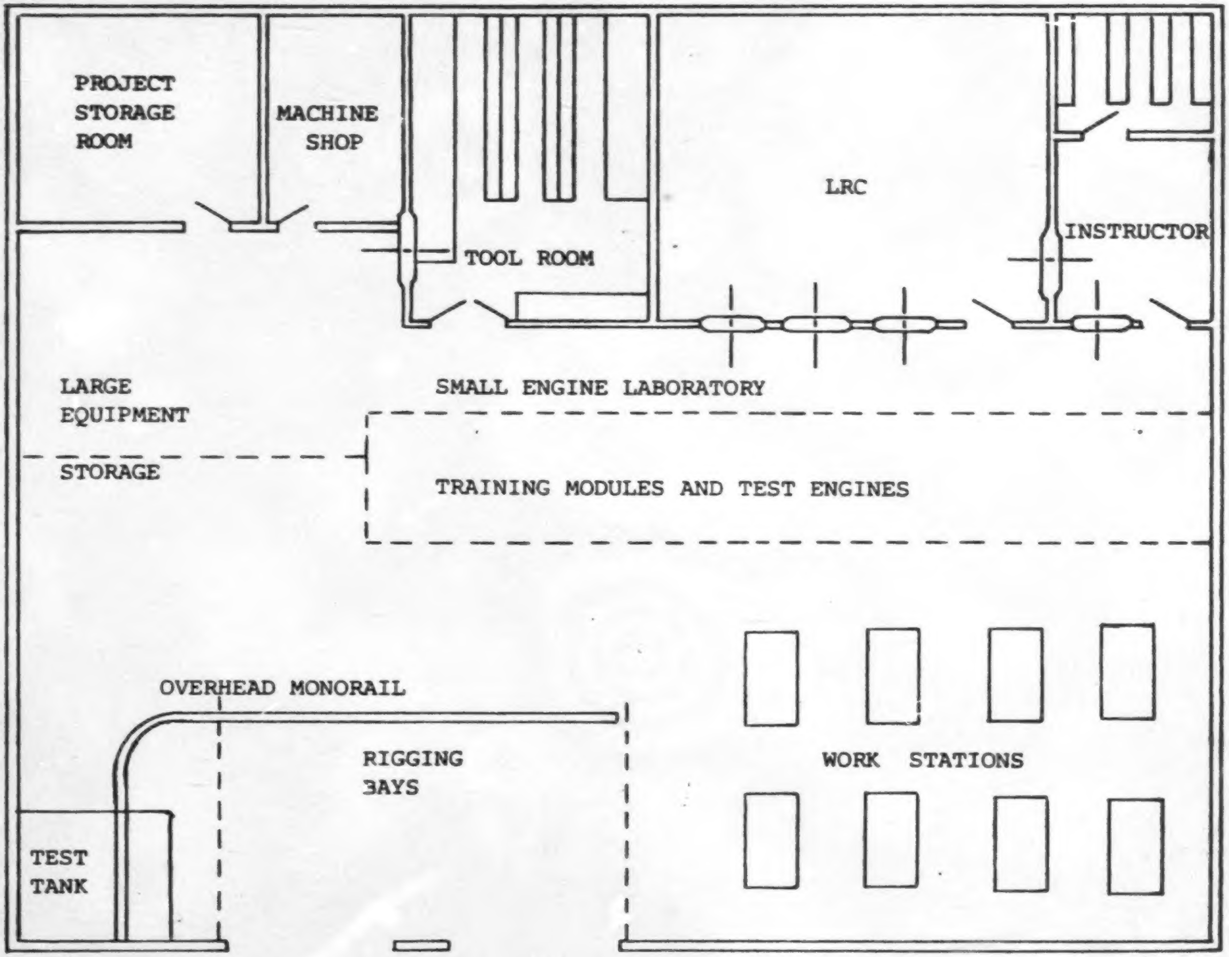

TRADE JOURNALS
CARRELS
REFERENCE BOOKS
WORK TABLE
STUDY TABLE
STUDY TABLE
AUDIO VISUAL STORAGE
LEARNING RESOURCE CENTER
STUDY TABLE
STUDY TABLE

IX-5

(FOR MEDIUM SPACE)


to lab
window
special storage
audiovisual storage
INSTRUCTOR
reference books
window
reference books
LEARNING RESOURCE CENTER
(FOR LARGE SPACE)
chalkboard
group seating
carrel
carrel
carrel
carrel
carrel
carrel
carrel
carrel
VTR PLAYBACK POSITION
screen
Scale: 1" = 4'

SMALL ENGINE MECHANICS/REPAIR


PROJECT STORAGE ROOM
MACHINE SHOP
LRC
INSTRUCTOR
TOOL ROOM
LARGE EQUIPMENT STORAGE
SMALL ENGINE LABORATORY
TRAINING MODULES AND TEST ENGINES
OVERHEAD MONORAIL
RIGGING BAYS
WORK STATIONS
TEST TANK

SECTION X

DEFINITION OF TERMS

DEFINITION OF TERMS

1. AV's-Audiovisuals - May refer to any picture and/or sound media. (ie. slides, tapes, filmstrips, 16 mm films, etc.)

2. Checkpoint - A student-instructor interface point wherein the instructor may give the student a test, perform a demonstration, or simply provide the student with additional needed information or instructions. Also a checkpoint may be used for motivational purposes.

3. Competency - The ability (knowledge, skills and attitudes) to perform all of a group or cluster of related tasks required to complete a designated activity according to occupational standards. In the educational setting the statement of a competency includes expected student outcomes in terms of knowledge, skills, and attitudes required to complete a designated activity as defined by incumbent workers according to the standards of the work place.

4. Course - A grouping of tasks and competencies which have a common knowledge base or are within a given domain.

5. Criterion-Referenced Measure - An exercise based upon a performance objective, the accomplishment of which measures attainment of that objective.

6. Criterion-Referenced Test - A test designed to measure student competencies based on job or industrial standards.

7. Curriculum Guide - A document containing the objectives, content, organization, and structure of an instructional program. It is designed for use by administrators, instructional supervisors and teachers.

8. D.O.T. - Abbreviation for Dictionary of Occupational Titles. Document provides nine digit codes identifying each occupation.

9. Duty - One of the distinct major activities involved in the work performed, comprising related tasks.

10. Exit Point - A predetermined point within an instructional program in which a student may exit with the essential competencies for a specific job. Usually defined in terms of D.O.T. codes and/or O.E. codes.

11. "Hands-On" - Statement implying the student is physically involved in a learning activity.

12. Individualized Instruction (I.I.) - A system of instruction allowing for a student to progress at their fastest rate.

13. Job - A specific area of specialization within an occupational field consisting of several closely related duties for which a person would expect to receive remuneration. Should be identified by DOT code.

14. Job Sheet - (Or Operations Sheet) - A project of a performance nature. Generally performed by the student in a lab or shop type environment or in a specialized work area.

15. Live Work - Generally refers to items brought into the course area for repair or adjustment. Examples of live work might be automobiles, radios and TV's, air-conditioners, etc. Another form of live work would be patrons visiting the cosmetology department to receive permanents or other services.

16. Master Copies - Original copies of slides, tapes or written materials set aside for the purpose of duplication.

17. Occupational Cluster - A group of occupations sharing a common core of competencies. Georgia's comprehensive high school vocational program is organized around this concept.

18. Occupational Inventory - A listing of tasks to be performed in a particular occupational area, grouped under duty classifications.

19. O.E. - Refers to the U. S. Office of Education. O.E. codes are a classification system (taxonomy) for occupational education programs.

20. Open Entry - Term meaning that a student may enter the program at any time and does not have to wait for quarter or semester breaks.

21. Open Exit - Term meaning that a student may leave a program any time he/she completes their occupational objective.

22. Performance Guide - A series of steps, arranged in a sequence ordinarily followed, which when completed may result in the performance of a task. Also called "teaching steps."

23. Performance Objective - A statement in precise, measurable terms of a particular behavior to be exhibited by a learner under specified conditions. It possesses each of the elements or characteristics specified below:

    a. Condition - The testing situation confronting the learner is clearly specified. This includes equipment provided or withheld, environmental constraints such as temperature, space, etc.

    b. Performance - The specific behavior expected of the learner is stated.

    c. Standard - The degree of acceptable performance is specified.

24. Performance Test - A test entailing not only the ability to answer questions, but measuring the students' ability to operate, manipulate, or perform a given task as well.

25. Program - An organized sequence of courses leading to an occupational objective. A program may contain one or more student exit points as defined by D.O.T. codes.

26. Program Objective - The outcome of a prescribed program of instruction. Usually expressed in terms of the occupation or job for which training is designed. D.O.T. codes are frequently used to identify program objectives or student exit points.

27. Self-Paced - Refers to a student moving through the prescribed training program at the fastest pace at which the student can meaningfully learn.

28. Sequencing - Putting any set or series of learning activities or tasks into proper order or sequence. Normally arranged from the simple to complex within groupings or blocks.

29. Software - Written or printed materials, slides, filmstrips, tapes, etc.

30. Student Manual - A document designed for use by students in a specific instructional program. It contains unit sheets, references, operational procedures or job sheets, etc.

31. Task - The smallest division of work in which a measurable output occurs. A logical and necessary step in the performance of a duty.

32. Task List - A listing of tasks performed by incumbent workers within a domain of interest. An example is a listing of all tasks performed by an automotive mechanic or by a worker in ornamental horticulture.

33. Unit - One "module" training materials; generally covering one learning task and programmed on one Unit Sheet. May cover more than one lesson.

34. Unit Guide - A curriculum guide sheet that lists a task and objective with the instructional activities, instructional materials, evaluation and approximate time required for a student to successfully complete the task.

35. V-TECS Catalog - A comprehensive collection of performance objectives, performance guides, criterion-referenced measures, and related data, organized by a job structure or career ladder within a domain of interest.

Federal law prohibits discrimination on the basis of race, color or national origin (Title VI of the Civil Rights Act of 1964); sex (Title IX of the Educational Amendments of 1972 and Title II of the Vocational Education Amendments of 1976); or handicap (Section 504 of the Rehabilitation Act of 1973) in educational programs or activities receiving federal financial assistance.

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The following individuals have been designated as the employees responsible for coordinating the department's effort to implement this nondiscriminatory policy.

Title II - Loydia Webber, Vocational Equity Coordinator
Title VI - Peyton Williams Jr., Associate Superintendent
of State Schools and Special Services
Title IX - Evelyn Rowe and Myra Tolbert, Coordinators
Section 504 - Jane Lee, Coordinator of Special Education

Inquiries concerning the application of Title II, Title VI, Title IX or Section 504 to the policies and practices of the department may be addressed to the persons listed above at the Georgia Department of Education, State Office Building, Atlanta 30334; to the Regional Office for Civil Rights, Atlanta 30323; or to the Director, Office for Civil Rights, Education Department, Washington, D.C. 20201.